

STANDARDS DEVELOPMENT BRANCH-OMOE



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1985

PERFORMANCE REPORT

WATER QUALITY SECTION



Ministry
of the
Environment

G. C. RONAN, Director
Laboratory Services Branch

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1985
PERFORMANCE REPORT
WATER QUALITY SECTION

P.J. Campbell (ed.)
Water Quality Section
Laboratory Services Branch
Ministry of the Environment

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ACKNOWLEDGEMENT

This report is dedicated to the technicians of the Water Quality Section who, in the pursuit of quality data for their customers, performed the more than 600,000 analyses summarized in this report. The magnitude of this task is apparent when one realizes that each datum required analysis, graphical representation, evaluation, and transfer of result to a microcomputer.

and

we gratefully acknowledge the contribution of Laurie Cleary and Michael McVicar who created the software package used to process the QC data and prepare the performance reports, and Ester Yip who assisted in organizing and editing the data.

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The Water Quality Section of the Ministry of the Environment, Laboratory Services Branch is responsible for high production analysis of water quality parameters. By using suitably sensitive instrumentation and methodologies in conjunction with carefully planned and monitored quality control and quality assurance programs, the Water Quality Section is able to maintain a high standard of analytical performance. This performance is certified through regular participation in interlaboratory round-robins. While results on these round-robins (i.e. IJC, USGS, LRTAP) are not included in this report, they are available on request (Appendix A). This report does provide an outline of the Quality Control program, and a summary of performance data for 1985.

In 1985 several tests were discontinued simply because they were requested too infrequently to maintain a QA/QC program. Hence, no data are reported for the filtered total phosphorus test, methylene blue active substances (MBAS) test, volatile acids test and the particulate total carbon (PTC) test. Iron and manganese were transferred to the Inorganic Trace Contaminants Section (ITC) in April 1985, and PTC was later revived by ITC in August 1986. The chlorine test was performed by special request because of its environmental significance but insufficient data are available for this report.

Quality Control Program

The major objective of the Quality Control (QC) program is to ensure immediate detection and correction of unacceptable analytical performance. In practice QC activities are divided into continual checks of basic analytical tools such as chemicals, water purity, containers and daily checks of instrumentation, calibration, recovery.

The quality control program for chemicals involves the purchase of high purity materials, and regular analysis of these chemicals for contamination. An understanding of their shelf lives and health effects is a vital part of this program. Distilled and deionized, deionized water sources are monitored daily for conductivity and dissolved organic carbon. Lines carrying these water supplies are inspected regularly and replaced when necessary. Stability studies for all solutions, whether reagents or standards, are conducted regularly, and the data are utilized to specify shelf-life in method descriptions.

Sample containers, filters, glassware and any other equipment used in the collection and analysis of samples are checked for leaching, adsorption and contamination. The laboratory publication "A Guide to the Collection and Submission of Samples for Laboratory Analysis" (1985) contains recommendations for sample containers, preservatives and sampling techniques.

The first of the daily checks is generally an instrumentation check. Each instrument must be in good working order before an analytical run can commence. A careful record of all maintenance is kept for each workstation.

While a quality control program must encompass all the facets listed above, the greatest effort is probably expended on calibrating the system (procedural step) and checking the calibration (QC). Calibration is achieved using standards covering the analytical range, and is performed before the analytical run commences. Since high degrees of both precision and accuracy are required to detect and minimize any between-run changes, standards are analyzed with as little handling or

preparation as possible. The following steps are taken when setting up most of the analytical instruments.

- 1) Distilled, deionized water (or other appropriate blank) is analyzed to adjust the baseline, or zero setting of the instrument, to a suitable region on the chart recorder or other readout.
- 2) If the system is known to be linear and stable, a high standard at 80% of full scale is analyzed at least twice. When the baseline and high standard have been set, a low standard of 10% -20% of full scale is usually analyzed. An incorrect reading for the latter requires an investigation: the problem may be curvature of the calibration, contamination of the blank water or improper preparation of one of the two standards.
- 3) If the system is known to have a non-linear calibration, several standards are required. A daily calibration curve is developed from these data.

N.B.: Throughout the remainder of this report, the upper concentration of the calibrated range will be referred to as full scale.

Once the system has been calibrated, quality control begins. Depending on the analytical procedure, one or more of the following QC checks is conducted: calibration control, blank control, recovery efficiency, control of potential interferences. To obtain duplicate data, the first aliquots of samples are analyzed early in the run. The second aliquots are analyzed later in the same run. In addition, calibration standards (sensitivity checks) are interspersed throughout the run.

Calibration Control

The calibration is confirmed by means of two control standards QCA and QCB and a long term blank (LTBL) which are made up and maintained independently of the calibration standards. The system is not calibrated with these solutions. QCA and QCB are chosen to be about 70% and 20% of full scale respectively. The long term blank is the water plus any reagent chemicals used in the preparation of QCA and QCB. While working calibration standards may be prepared daily or weekly, the control standards are used for long periods of time. Since the calibration solutions are prepared so often, there is a chance that errors in preparation may occur from time to time. By checking the calibration with control standards, errors in the calibration standards can be detected.

When the control standards are analyzed, their sum (A+B) and difference (A-B) are plotted versus time on a control chart and used immediately by the technician to determine whether the calibration process is in control. The control limits against which the daily A+B and A-B values are compared are determined from practical experience. They should not be set much tighter than the system to which they are applied can tolerate nor should they be set much looser than long term data suggests can be routinely maintained. In general, the daily A+B and A-B values are allowed to vary by ± 2 to 5% of full scale and ± 1 to 3% of full scale respectively. If either the sum or the difference is out of control, the system is stopped, corrective action is taken and the control standards are re-analyzed.

The actual values of QCA and QCB are examined whenever the sums or differences are out of control, but they are not themselves separately controlled. Over the long run, the standard deviations of QCA and QCB are used to estimate the

between run standard deviation (S). Values for S and SW can be calculated as follows:

$$2(Sw)^2 = (sd_{A-B})^2 \qquad 2S^2 = (sd_A)^2 + (sd_B)^2$$

where sd_A = standard deviation of QCA in all runs
 sd_B = standard deviation of QCB in all runs
 sd_{A-B} = standard deviation of QCA-QCB in all runs

N.B.: If a second range is employed for a test, two more QC control standards are used. These are QCC and QCD and are about 80% and 20% for the lower range full scale. (QCB and QCC may be a common solution used for both ranges). The extra pair of calibration controls allow the effect of calibration control concentration over a long term on S and Sw. In many systems, the in-run standard deviation (Sw) is not particularly concentration dependent, although the between run standard deviation (S) may be.

N.B.: For a detailed description of the A/B control process, the reader is directed to references 1,2 and 3 given in the bibliography.

Recovery Checks

In methods where sample preparation such as digestion or extraction is required, a recovery check suitable to that system is required to estimate the efficiency of the analysis. These solutions are not used to calibrate the instrument, but corrections for the digestion blank and matrix effects are estimated and applied if necessary.

Recovery standards are chosen to test all facets of the analysis. If a digestion step is supposed to liberate a substance or convert one substance into another before analysis can take place, then the recovery standard is chosen to test the efficiency of this step. For example, glycine is used to test the efficiency of the digestion step in Total Kjeldahl Nitrogen analyses, and pyrophosphate is used in the Total Phosphorus test. Without pre-treatment (in this case, digestion) these chemicals give a zero response in their respective tests. Recovery standards are usually prepared at 0%, 20%, and 80% of full scale. These recovery standards are then analyzed daily in the same manner as regular samples. The percent recovery can be calculated by:

$$\% \text{ Recovery} = \frac{\text{Measured Value}}{\text{Theoretical Value}} \times 100$$

The 0% standard is referred to as the digested blank and the 80% and 20% standards are referred to as R_1 and R_2 respectively. For an analytical run to be accepted, R_1 and R_2 should be within ± 5 and 15% respectively of their expected values and the average digested blank should be within three standard deviations of its historical mean.

N.B.: If a second range is employed for a test, at least one additional recovery standard is used (i.e. R_3 ; control limits of ± 5 and 15% of expected values apply to highest and lowest concentrations respectively -see Recovery Plots, p. 10A).

Sensitivity Checks

A gradual increase in peak height of standards may be due to increasing laboratory temperature while gradual decreases in the peak heights may be due to decreasing temperature or deterioration of the reagents. To monitor this, a high standard is run after every twenty samples and the results are compared to the original calibration standards. These checks may be run more frequently where required.

Several tests performed on automated equipment suffer from baseline shift throughout the run due to reagents coating out on the glassware. Contamination of samples also may occur during a run if, for example, an ammonia cleanser is used in the vicinity of the ammonia test. Blanks are interspersed with in run standards to detect any such baseline shifts. The baseline should not shift more than 5% of full scale over the course of the entire run. For most linear systems sensitivity changes within the 5% limits can be corrected mathematically.

Interference Checks

Interference checks are run on any test where a material often may be present in large enough concentrations to affect the results. The checks are usually near the threshold concentration, beyond which the methodological safeguards to minimize the interferences are no longer effective. These checks indicate that the safeguards are effective up to the specified concentration(s).

N.B.: The Water Quality Section does not perform spike checks on a routine basis although they may be included in the method development.

In-Run Duplicate Data

Natural samples are selected on a regular basis for nonadjacent within-run duplicate analysis. Generally, one sample out of twenty is run in duplicate up to a maximum of three per day. One sample of each pair is analyzed near the beginning of the run after QC and Recovery standards. The other sample of the pair is analyzed later in the regular sample run. By analyzing samples in duplicate, the analyst can estimate his ability to obtain repeatable analytical results within a short period of time. The observed differences in duplicate results, for all the duplicate samples, are accumulated and sorted according to sample concentration span. A standard deviation is then calculated for each of these concentration spans using a computer program. The algorithm differs from the conventional standard deviation (designated by a "1" on data summaries) as follows:

Conventional Std. Dev.
(1)

$$S_1 = \sqrt{\frac{\sum (\bar{x} - x_n)^2}{n - 1}}$$

Where:

S_1 = sample standard deviation
 n = number of results
 \bar{x} = mean of results
 x_n = results from x_1 to x_n

Std. Dev. of Duplicates
(2)

$$S_2 = \sqrt{\frac{\sum (x_1 - x_2)_n^2}{2n}}$$

Where:

S_2 = standard deviation of duplicate samples
 n = number of duplicate **pairs**
 $(x_1 - x_2)_n$ = difference between duplicate **pairs** from 1 to n

Widely varying results for duplicate analyses of the same sample may signify a breakdown in the analytical system. Duplicate results should differ less than 5% of full scale.

FORMAT FOR PERFORMANCE REPORT

The types of samples analyzed in the Water Quality Section include ground waters, surface waters, sewage, industrial wastes, leachates, soil extracts, drinking water, drinking water sources, and precipitation. In order to handle these varied sample types, the section is divided into a number of laboratories, each responsible for one or more sample types. The Laboratory Information System (LIS) is a centralized computer system which routes samples to the proper laboratory and to a specific workstation.

There is a performance report for each test in each of the laboratories where the test was performed. Information is provided to assist the reader in identifying the data which is appropriate to the various sample types and classes. The performance reports consist of a general summary sheet for each parameter followed by one or more sheets of data tabulated for 1985 and a full page plot of the calibration charts, recovery checks and duplicate results where applicable. The remainder of this section outlines the type of information which is included in the individual performance reports.

SUMMARY SHEET

Title:

This gives the name of the parameter in this particular performance report.

Identification:

Laboratory

This gives the laboratory where the test is performed on the sample types listed below.

LIS Test Name Code

This is the computer code name for the particular parameter, i.e. the code the sampler would see on the final data reports.

Workstation Code

This is the computer code for the workstation to which the sample has been routed.

Method Code

This is the computer code for the analytical procedure which is used at the above workstation.

Method Introduced

This is the date (given as Day/Month/Year) on which this particular method was implemented in the above laboratory.

Units

These are the units in which the results are reported e.g. mg/L as N.

Unit Code

This is the computer code for the units.

Supervisor

This is the name of the supervisor responsible for the laboratory given above.

Sample Type/Matrix

This section lists the various sample types that are accepted at this workstation.

Sampling:

This gives a brief description of the type of bottle to use, what preservatives to use if any, and also the minimum volume of sample that the laboratory requires to do the test. Any sample preparation which must be performed by field personnel is also listed.

Sample Preparation:

This section lists only manual sample preparation techniques (i.e. filtration or extraction) which must be carried out at the laboratory.

Analytical Procedure:

This section gives a brief description of the analytical method used to test the parameter in question. For detailed method descriptions the reader is referred to reference 4 in the bibliography. The methods described in this section apply to 1985.

Instrumentation:

This section gives a brief listing of the instruments used to perform the test. Detailed instrumentation is given in reference 4. Many of the descriptions given will include reference to automated modular continuous flow systems. Such systems consist of an automatic sampler, peristaltic pump, manifold for reagent addition, detection system and an output system such as a chart recorder or printout. The detection system is at least one of the following: colourimeter, scanning spectrophotometer, ion chromatograph, atomic absorption spectrophotometer, conductivity meter, electronic balance, pH meter, or specific ion electrode plus meter. Use of microcomputers to control operation of analytical equipment and/or data acquisition is identified.

Reporting:

This section gives the maximum number of significant figures used to report the result. If an analytical result is determined to be zero, the Water Quality Section reports the MINIMUM INCREMENT (W) in this place. This is done so that the data user can have some idea of how small an analytical result we could determine. For tests using strip chart recorders, which are read manually, W is typically set at 0.5% of full scale. With the increasing use of digital displays and direct computer input, the readability may far outstrip the reproducibility. Here, the W values is trimmed to be one extra significant digit beyond the statistically-determined T value described next.

The DETECTION CRITERION (T) is a value obtained by statistical manipulation of data obtained from the analysis (within run) of duplicate aliquots of the same sample. This value does not guarantee the validity or accuracy of an analytical

result, but it can aid the data user in testing the validity of statements made about a given analytical result or environmental situation. The analyst wishes to warn the data user that a given result is so low that there is a reasonable chance that the value could be zero. If an analytical result greater than the detection criterion is obtained, the risk of making a Type 1 error, i.e. of reporting something as present when in fact it is absent, is less than 0.5%. The detection criterion is determined by multiplying the standard deviation of duplicates in the lowest concentration span by 3. If insufficient data were available, the T value was calculated using the standard deviation from the next higher concentration span.

Calibration:

This section lists the number of standards used to calibrate the analytical system daily.

Controls:

This section lists the control checks used throughout the analytical process. The CALIBRATION control standards QCA, QCB, QCC and QCD and LTBL are used to monitor the calibration. The RECOVERY controls are used to monitor the efficiency of the overall test. These are the R₁, R₂, R₃, R₄ and digested blank standards.

The DRIFT controls are the standards which are used to monitor the instrument stability throughout a run. The number of standards used is given and the frequency of their usage is given whenever the latter differs from "every 20 samples".

The INTERFERENCE controls are those solutions which are analyzed to check that potential interferences are eliminated. Concentrations of the interference controls are designed to exceed concentrations expected in the vast majority of samples

Modifications:

This section lists any modifications to the test since the publication of "Handbook of Analytical Methods for Environmental Samples" (HAMES) (Reference 4).

NOTES:

Any explanatory notes which the analyst feels may aid the data user in interpreting the information provided.

N.B.: If headings have been omitted from a particular summary sheet, the reader should assume that such headings are not applicable to this test.

PERFORMANCE DATA

For each performance report there will be at least one tabulated data page to cover 1985.

Title:

This gives the name of the parameter in this particular performance report.

Quality Control Data From:To:

These dates specify the collection period for the data tabulated on this page. Dates are given as day/month/year. Pages covering portions of the year are provided if any of the control solutions were changed or the method was modified. QC data are not provided for parts of the year when the test was inactive.

Lab:

This lists the laboratory in which this data was collected.

Analytical Range:

The analytical range in concentration units is given. The range normally covers the span from the detection criterion to 100% of full scale. N/A or a blank for the detection criterion indicates that insufficient data were available in the lowest range of duplicates for direct calculation.

Calibration Control:

This section tabulates all the data collected for the calibration control standards (QCA, QCB, QCC and QCD). The table headings give the number of data points collected, the expected concentration for each control standard as well as their sum and difference; the average concentrations measured, the bias (difference obtained by subtracting the expected concentration from the average concentration measured); and the standard deviation calculated for each standard, their sum and their difference.

The within run standard deviation (S_w) and the between run standard deviation (S), the ratio S/S_w and the ranges for acceptance of the day's A+B and A-B values are also shown.

N.B.: If the system employs two analytical ranges, values for QCC and QCD are also given.

N.B.: All data are reported in the concentration units shown at the top of the page unless otherwise stated in the Summary Sheet.

Recoveries:

This section tabulates the data collected for the recovery control standards (R_1 , R_2). The number of data points, the expected concentration, the average measured concentration and the calculated standard deviation are listed for each recovery standard. If no recovery checks were performed, this section is omitted.

N.B.: All data are reported in the concentration units shown at the top of the page unless otherwise stated.

Duplicates:

This section tabulates the data collected from the analyses (within run) of duplicate aliquots from the same sample. The number of data pairs used, the sample concentration spans into which the analyses were sorted, the mean standard deviation and the coefficient of variation (relative standard deviation) for each

span are given. The coefficient of variation (%) is obtained by dividing the mean standard deviation for a particular span by the mean concentration of duplicate results in that span and then multiplying by 100.

N.B.: All data are reported in the concentration units shown at the top of the page unless otherwise stated.

Detection Criterion:

The detection criterion, which is based on duplicate data, is calculated by multiplying the mean standard deviation for the lowest concentration span by 3. In some years the amount of such data is insufficient, and thus the calculated detection criterion is suspect.

Other Checks:

This section lists data for checks such as the long term blank, digested blank, standard cal settings on colourimeters, etc. The number of data points, the data mean and the calculated standard deviation are given.

QUALITY CONTROL GRAPHS:

For each data page there is one QC graph for 1985.

Title:

This gives the name of the parameter in the performance report and appropriate units.

Dates:

Dates on plots correspond to identical periods on the performance data pages (day/month/year).

Calibration Control:

A+B, A-B, C+D, and C-D (if used) are plotted on a horizontal scale covering the period of data collection. Points are equally spaced. The vertical scale is centred on the expected value for calibration control. Control limits (\pm CL) were chosen from previous analytical performance (when available). Frequent excursions outside the limits indicate a system out of control or excessively tight limits. An asterisk marks each point more than 15% outside the limits. Units on the vertical scale are identical to those in the title unless marked otherwise in the Summary Sheet.

Recovery Plots:

Where recovery checks are performed the highest and lowest concentrations are plotted (i.e. if four recovery checks are run, R1 and R4 are plotted). The horizontal scale is identical to the calibration control plots. The vertical scale is centred on the expected value for the recovery checks. Arbitrary control limits have been assigned (but not drawn) as ± 5 and 15% of the expected value for two recovery checks, ± 5 , 10, 15% for three checks, and ± 5 , 8, 12, 15% for four checks

going from highest to lowest concentration. The sliding scale is used since recoveries usually range from 80% to 20% of full scale. Hence, the absolute control limits are about $\pm 4\%$ at the high and $\pm 3\%$ at the low end of full scale.

Duplicate Plots:

All duplicate results for the period are summarized in a three segment plot at the bottom of the page. The three segments are 0-20%, 20-50% and 50-100% of full scale (full scale is defined below on the same page and may be different from the value given in the Performance Report to improve the clarity of presentation). In each concentration category, the absolute differences between duplicate samples are tabulated to determine the frequency with which the duplicate pairs differ by 0-2, 2-4, 4-6, and greater than 6% of full scale. The relative number of occurrences in each range are plotted as a percentage of the total in three frequency histograms. As the histogram ranges are calculated with respect to full scale, they cover the same span of absolute differences in concentration for each of the graphs, and the distributions can therefore be compared directly.

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APPENDIX - A

Responsibility for QC/QA Tasks: 1985

The supervisors for the Water Quality Chemistry laboratories (416 248 3512) and their unit leaders or senior technicians in 1985 were:

Manager	- Larry Vlassoff
Domestic Water Laboratory	- Michael Rawlings - Stuart Barnes
Precipitation Laboratory	- Michael Rawlings - Jenifer McBride
Rivers and Lakes Laboratory	- Joan Crowther - Walter Wright - Stella Tracy - Abraham "Pete" Millar
Sewage and Industrial Waste Laboratory	- Peter Campbell - Ben Cheung - Vera Turner
Dorset and Mobile Laboratory	- Frank Tomassini - Charlie Chun (Dorset) (705 766 2412) - Peter Wilson (Mobile)

Responsibility for QC/QA Tasks: 1986

Reorganization of staff in April 1986 led to the following changes in responsibility:

<u>Class</u>	<u>Description</u>	<u>Contact & Assistance</u>
C	Chlorophyll	P. Millar/B. Bobor
G	Great Lakes	J. Crowther/H. Broomer
H	Public Health Insp.	J. Crowther/V. Ferraro
R	River (Surface Water)	C. Crowther/D. Whitman
S	Sewages (UTOP, M & P)	B. Cheung/V. Turner
P	Precipitation	J. McBride/
W	Water (Grand/Domestic)	J. McBride/
AS	APIOS Air Filters	J. McBride/
I & LW	Industrial Wastes	S. Tracy/V. Turner
SX	Soil Leach (APIOS)	J. Crowther/J. McBride
CC & ERTF	High Priority	V. Turner/B. Cheung
DP, DR, DX, DS	Dorset Precipitation, Rivers & Lakes, Soil Leach, Stemflow	C. Chun/S. Barnes P. Grauds D. Evans

Supervisors (Contact for General Discussion, Planning, Problem Samples, etc.)

Mike Rawlings	Colourimetric Tests
Frank Tomassini	Ion Chromatographic and Atomic Absorption Tests
Peter Campbell	BOD, Solids, Matrix Assessment, Titration Tests
Joan Crowther	All tests

APPENDIX - B

Glossary

AAS	- Atomic Absorption Spectrophotometer
Abs	- Absorbance
Av	- Average
BL	- Blank
C	- Degrees Centigrade
cm	- Centimeter
Concn	- Concentration
Date	- Day/month/year
DDW	- Distilled, deionized water
DW	- Distilled water
FTU	- Formazin Turbidity Units
g	- Gram
HAMES	- Handbook of Analytical Methods for Environmental Samples, M.O.E.
HOAC	- Acetic Acid
HZU	- Hazen Units
L	- Liter
LAB	- Laboratory
LIS	- Laboratory Information System
LTBL	- Long Term Blank
M	- Molar
mg	- Milligram
mil	- One-thousands of an inch
min	- Minute
mL	- Milliliter
mm	- Millimeter
N	- Normal
N/A	- Not Available
nm	- Nanometer
oz	- Ounce
QC	- Quality Control
rpm	- Revolutions per minute
S	- Between run standard deviation for QC

APPENDIX - B (Continued)

Glossary

Sw	- Within run standard deviation for QC
sd	- Standard deviation
S. class	- Weights that have not been officially calibrated within past six months
Standard Cal	- Colourimeter setting controlling electronic expansion
STD	- Standard
TCU	- True Colour Units
u	- Micron or Micrometer
ug	- Microgram
uS	- Micro-Siemen
V/V	- Concentration based on volume measurements

APPENDIX - C

W & T:

The latest printout (valid at date of publication) of W & T values for all known active workstations in the Water Quality Section follows. Since the values changed after the last QA/QC Performance Report (1982-84) and are in the process of changing again, clarification is needed.

Workstation, test codes, and full scale have been defined earlier in the introduction. Std. dil. refers to the standard dilution employed in sample preparation. A standard dilution of "1" indicates that the sample was analyzed without dilution with respect to the standard used for calibration. The 1985 W and T values and the standard deviation of duplicates (S Dupl) were obtained from the 1985 performance data in this report, when available. Some of the values are based on 1986 data. Parameters/workstations/test codes reflect the reorganization of the Water Quality Section in early 1986.

Prior to 1985, W was the minimum determinable amount, and T was 1.645 times the standard deviation of duplicates in a concentration range of about 0-20% of full scale. The W value was supplied to the client to indicate the smallest amount that we could determine when the actual response (=result) was zero. In 1985, T was made three times the standard deviation of duplicates (based on the 1982-84 Performance Report -see reference 3) and W was changed only where the minimum amount had changed. The increase in T was made to be consistent with recommendations by the American Chemical Society (see reference 8) and to provide a level above which data users could have more than 99% confidence that a result obtained was above zero.

Through internal discussions and attempts to provide a consistent approach to data reporting, the Water Quality Section has been asked to calculate W from the standard deviation of duplicates by rounding down the nearest 1,2 or 5 digit. T is to be five times W. The new list has been calculated this way where possible, using the S Dupl values.

Although values below W will still be treated as zero, we will retain an extra digit in all results greater than or equal to W so that the standard deviation of duplicates can be calculated, and we can detect small improvements or deterioration in the performance of tests. The introduction date for the new W and T values has been set for November 1, 1986.

PARAMETER	UNITS	WORKSTATIONS	TEST CODES	FULL SCALE	STD DIL	1985 W	1985 T	S DUPL	NEW W	NEW T
Acidity-Gran	ueq/L as H	PHACD	ACDG	1000	1	0.1	4.7	1.56	1	5
Acidity-TFE	mg/L as CaCO3	PHACD	ACDT	100	1	0.01	0.24	0.081	0.05	0.25
Alkalinity-Gran	mg/L as CaCO3	DOT	ALKTI	25	1	0.01	0.24	0.078	0.05	0.25
Alkalinity-Gran	mg/L as CaCO3	RATS	ALKTI	25	1	0.01	0.45	0.15	0.1	0.5
Alkalinity-TFE	mg/L as CaCO3	DOT	ALKT, ALKT3	100	1	0.01	0.254	0.081	0.05	0.25
Alkalinity-TFE	mg/L as CaCO3	WATS	ALKT	500	1	0.2	1.6	0.55	0.2	1.0
Alkalinity-TFE	mg/L as CaCO3	RATS	ALKT	250	1	0.01	0.78	0.261	0.2	1.0
Aluminum	ug/g as Al	DOCATION	ALESC	200	1	0.1	3.9	1.3	1	5
Aluminum	% as Al	DOMETDI	ALED1	0.4	1	0.001	0.006	0.002	0.002	0.10
Aluminum	% as Al	DOMETALX	ALEPY	0.2	1	0.001	0.009*	0.003	0.002	0.010
Aluminum	ug/g as Al	DOSOLAL	ALECA	40	1	0.01	0.72	0.24	0.2	1.0
Aluminum-CVreac.	ug/L as Al	DOMISC	ALNDCV, ALEXCV	1000	1	1	12#	4.0	2	10
Aluminum	ug/L as Al	DOAAS	ALUT	200	1	1	3#	1	1	5
Cadmium	ug/L as Cd	DOAAS	CDUT	2	1	0.001	0.057#	0.019	0.01	0.05
Calcium	ug/g as Ca	DOCATION	CAEXC	800	1	1	12	4	2	10
Calcium	mg/L as Ca	WAAS	CAUR	175	1	0.1	0.9	0.28	0.2	1.0
Calcium	mg/L as Ca	PRAA	CAUR	2	1	0.01	0.08	0.025	0.02	0.1
Calcium	mg/L as Ca	RMAAS	CAUR	35	1	0.01	0.33	0.11	0.1	0.5
Carbon-Carbonate	% as C	DOTIC	TIC	100	1	1	22	7.4	5	25
Carbon-Dis.Inor.	mg/L as C	DOCOP	DIC	10	1	0.01	0.05	0.017	0.01	0.05
Carbon-Dis.Inor.	mg/L as C	ROM	DIC	40	1	0.2	0.46	0.154	0.2**	1.0
Carbon-Dis.Org.	mg/L as C	ROM	DOC	20	1	0.1	0.28	0.095	0.1**	0.5
Carbon-Soil Org.	% as C	DOOXMAT	ORGC	100	1	0.01	0.25	0.084	0.05	0.25
Chloride	mg/L as Cl	PRIC1	CLIDUR	2	1	0.01	0.05	0.018	0.01	0.05
Chloride	ug/filter as Cl	PRLOV	CLIDUR	100	1	0.5	0.8	0.28	0.5**	2.5
Chloride	mg/L as Cl	ROM	CLIDUR	50	1	0.05	0.24	0.081	0.05	0.25
Chlorophyll-a	ug/L	RCHLO	CHIRAT	10	1	0.01	0.51	0.171	0.1	0.5
Chlorophyll-b	ug/L	RCHLO	CHIRBT	10	1	0.01	0.31	0.102	0.1	0.5
Chlorophyll-acid	ug/L	RCHLO	CHIRAC	10	1	0.01	0.43	0.144	0.1	0.5
Colour-true	TrueColourUnits	DOCC	COLTR	100	1	1	4	1.2	1	5
Colour-true	TrueColourUnits	WOOL	COLTR	100	1	0.5	1.1	0.37	0.5**	2.5
Colour-true	TrueColourUnits	ROCOL	COLTR	100	1	0.1	1.6	0.53	0.5	2.5
Conductivity	uS/cm	WATS	COND25	5000	1	1	3	1.0	1	5
Conductivity	uS/cm	DOCC	COND25	300	1	0.1	1.3*	0.43	0.2	1
Conductivity	uS/cm	PRIC1	COND25	100	1	0.1	0.9	0.31	0.2	1
Conductivity	uS/cm	RATS	COND25	2000	1	1	2.1	0.7	1**	5
Conductivity	uS/cm	COND-SEW	COND25	3000	1	1	4	1.2	1	5

PARAMETER	UNITS	WORKSTATIONS	TEST CODES	FULL SCALE	STD DIL	1985 W	1985 T	S DUPL	NEW W	NEW T
Copper	ug/g as Cu	DOHMT	CUUT	250	1	0.1	1.6	0.55	0.5	2.5
Fluoride	ug/L as F	DOSPF	FFIDUR	70	1	0.1	1.4	0.48	0.2	1.0
Fluoride	mg/L as F	WFNO3	FFIDUR	2	1	0.01	0.03	0.009	0.01**	0.05
Iron	% as Fe	DOMETDI	FEED1	0.4	1	0.001	0.009	0.003	0.002	0.010
Iron	%as Fe	DOMETALX	FEEPY	0.2	1	0.001	0.006*	0.002	0.002	0.010
Lead	ug/g as Pb	DOHMT	NIUT	250	1	0.1	2.0	0.7	0.5	2.5
Lead	ug/L as Pb	DOASV	PBUT	2	1	0.01	0.6*	0.2#	0.1	0.5
Magnesium	ug/g as Mg	DOCATION	MGESC	300	1	0.1	2.8	0.92	0.5	2.5
Magnesium	mg/L as Mg	WAAS	MGUR	35	1	0.05	0.3	0.11	0.1	0.5
Magnesium	mg/L as Mg	PRAA	MGUR	0.5	1	0.005	0.012	0.0041	0.005**	0.025
Magnesium	mg/L as Mg	RMAAS	MGUR	7	1	0.01	0.06	0.021	0.02	0.1
Nickel	ug/g as Ni	DOHMT	NIUT	250	1	0.1	2.0	0.7	0.5	2.5
Nitrogen A+A	ug/L as N	DONUT	NNHTFR	1000	1	1	3.5	1.17	1	5
Nitrogen A+A	mg/L as N	PRNUT	NNHTUR	5	1	0.005	0.014	0.0039	0.005**	0.025
Nitrogen A+A	ug/filter as N	PRSEQ	NNHTFR	125	1	0.125			0.1	0.5
Nitrogen A+A	mg/L as N	RNDNP	NNHTFR	2	1	0.002	0.01	0.0037	0.002	0.010
Nitrogen A+A	mg/L as N	SDNP	NNHTFR	50	1	0.05	0.15	0.052	0.05	0.25
Nitrogen-NO3	mg/L as N	PRIC1	NNO3UR	2	1	0.01	0.05	0.018	0.01	0.05
Nitrogen-NO3	ug/filter as N	PRSEQ	NNO3FR,NNRICF	50	1	0.25	0.5	0.18	0.2	1
Nitrogen-NO3	ug/filter as N	PRLOV	NNO3UR	100	1	0.5	1.2	0.41	0.5**	2.5
Nitrogen-NO3+NO2	mg/L as N	WFNO3	NNOTUR	20	1	0.1	0.1	0.03	0.1**	0.5
Nitrogen-NO3+NO2	ug/L as N	DONUT	NNOTFR	500	1	2	9	3.0	2	10
Nitrogen-NO3+NO2	mg/L as N	RNDNP	NNOTFR	5	1	0.005	0.06	0.02	0.02	0.10
Nitrogen-NO3+NO2	mg/L as N	SDNP	NNOTFR	50	1	0.05	0.24	0.08	0.05	0.25
Nitrogen-NO2	mg/L as N	RNDNP	NNO2FR	0.25	1	0.0005	0.003	0.001	0.001	0.005
Nitrogen-NO2	mg/L as N	SDNP	NNO2FR	2	1	0.005	0.009	0.0031	0.005**	0.025
Nitrogen-T.Kjel.	mg/L as N	RINP	NNIKUR	2	1	0.01	0.06	0.019	0.02	0.10
Nitrogen-T.Kjel.	mg/L as N	STKNP	NNIKUR	25	2	0.05	0.19	0.063	0.05	0.25+
Oxygen-Biochem.	mg/L as O	SBBOD,SBBOD5	BOD5,BOD5C,ETC	400	1	0.01	1.0	0.33	0.2	1.0
Oxygen-Chem.Dem.	mg/L as O	ROOD	COD,CODF	100	1	1	2	0.5	1**	5
Oxygen-Chem.Dem.	mg/L as O	SBCOD	COD,CODF	500	1	2	13	4.4	2	10
Oxygen -diss.	mg/L as O	DOCOP	DO		1					
Particle size	% sand	DOPARTZ	SAND	100	1	0.1	2.5	0.84	0.5	2.5
Particle size	% silt	DOPARTZ	SILT	100	1	0.1	3.4	1.2	1	5
Particle size	%clay	DOPARTZ	CLAY	100	1	0.1	4.0	1.3	1	5

PARAMETER	UNITS	WORKSTATIONS	TEST CODES	FULL SCALE	STD DIL	1985 W	1985 T	S DUPL	NEW W	NEW T
pH	pH units	DOCOP	PH	-	1	0.01	N/A			
pH	pH units	DOT	PH	-	1	0.01	N/A			
pH	pH units	DOSOILPH	PHEW, PHECA	-	1	0.01	N/A			
pH	pH units	WATS	PH	-	1	0.01	N/A			
pH	pH units	PHACD	PH	-	1	0.01	N/A			
pH	pH units	RATS	PH	-	1	0.01	N/A			
pH	pH units	SBPH	PH	-	1	0.01	N/A			
Phenolics-Reac.	ug/L as Phenol	ROPHEN	PHNOL	50	1	0.2	1.0	0.35	0.2	1.0
Phosphorus-Ortho	mg/L as P	RNDNP	PPO4FR	0.125	1	0.0005	0.0030	0.0009	0.0005	0.0025
Phosphorus-Ortho	mg/L as P	SDNP	PPO4FR	10	1	0.01	0.05	0.017	0.01	0.05
Phosphorus-Total	ug/L as P	DOP	PFUT1, _2, _3	200	1	0.1	0.8	0.28	0.2	1.0
Phosphorus-Total	mg/L as P	RINP	PFUT	0.2	1	0.001	0.007	0.0023	0.002	0.010
Phosphorus-Total	mg/L as P	STKNP	PFUT	5	2	0.01	0.03	0.0086	0.01	0.05+
Potassium	ug/g as K	DOCATION	KKESC	300	1	0.1	6.6	2.2	2	10
Potassium	mg/L as K	WAAS	KKUR	50	1	0.05	0.15	0.051	0.05	0.25
Potassium	mg/L as K	PRAA	KKUR	1	1	0.005	0.025	0.0082	0.005	0.025
Potassium	ug/Filter as K	PRLOV	KKUR	50	1	0.25			0.2	1
Potassium	mg/L as K	RMAAS	KKUR	10	1	0.01	0.05	0.017	0.01	0.05
Silicon	mg/L as Si	ROM	SIUR	10	1	0.02	0.04	0.012	0.02**	0.10
Sodium	mg/L as Na	WAAS	NAUR	100	1	0.1	0.7	0.23	0.2	1.0
Sodium	mg/L as Na	PRAA	NAUR	1	1	0.005	0.016	0.0053	0.005	0.025
Sodium	ug/Filter as Na	PRSEQ	NAUR	50	1	0.25	2.40	0.80	0.2	1
Sodium	mg/L as Na	RMAAS	NAUR	20	1	0.01	0.08	0.026	0.02	0.10
Solids-Diss.	mg/L	SOLIDS	RSF	3000	1	0.5	9.2	3.06	2	10
Solids-Diss.Ign.	mg/L	SOLIDS	RSFA	3000	1	1	6.0	1.99	2	10
Solids-Partic.	mg/L	SOLIDS	RSP	3000	1	0.1	2.5	0.83	0.5	2.5
Solids-Part.Ign.	mg/L	SOLIDS	RSPA	3000	1	0.1	N/A	0.18	0.5	2.5
Solids-Total	mg/L	SOLIDS	RST	6E04	1	0.5	13	4.4	2	10
Solids-Tot.Ign.	mg/L	SOLIDS	RSTA	3E04	1	0.5	52	17.2	10	50
Sulphate	ug/g as SO4	DOANIONX	SSO4EW	100	1	0.1	2.6	0.9	0.5	2.5
Sulphate	mg/L as SO4	PRIC1	SSO4UR	10	1	0.05	0.09	0.032	0.05**	0.25
Sulphate	ug/filter as SO4	PRSEQ	SSO4FR, SSO4NF	250	1	1.25	3	1.1	1	5
Sulphate	ug/filter as SO4	PRLOV	SSO4UR	500	1	2.5	9	3.1	2	10
Sulphate	mg/L as SO4	RMDSO4	SSO4UR	200	1	0.05	0.76	0.253	0.2	1.0
Sulphur Dioxide	ug/filter as SO2	PRSEQ	SSO2FR	350	1	1.65	3.9	1.28	1	5

PARAMETER	UNITS	WORKSTATIONS	TEST CODES	FULL SCALE	STD DIL	1985 W	1985 T	S DUPL	NEW W	NEW T
Turbidity	FTU	WIURB	TURB	200	1	0.01	0.09	0.031	0.02	0.10
Turbidity	FTU	RMIURB	TURB	50	1	0.01	0.21	0.069	0.05	0.25
Zinc	ug/L as Zn	DOASV	ZNUT	15	1	0.01	0.71#	0.24	0.2	1.0
Zinc	ug/g as Zn	DOHMT	ZNUT	250	1	0.1	4.0	1.3	1	5

* Standard deviation of duplicates (S DUPL) not taken from lowest range (insufficient data).

** New "W" was rounded up to be above smallest determinable value (1985 W).

1986 data used.

+ Minimum dilution factor is 2. W & T given above are values for undiluted samples (factor 1).

*** ACIDITY - GRAN ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/08/82
LIS Test Name Code:	ACDG	Units	: ueq/L as H
Work Station Code	: PHACD	Unit Code	: 063801
Method Code	: 001BT5	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow			

SAMPLING:

Quantity Required: 15 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Sample aliquots (10.0 mL) are titrated with 0.01N sodium hydroxide to a pH >8.3. The titrant is standardized against 0.0005N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. Data are subjected to Gran analysis.

N.B. pH and total fixed endpoint acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.1 Detection Criterion (T): 4.7

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration : LTBL (expected result is 16.6 ueq/L as H) plus two standards, eg, QCA

MODIFICATIONS:

01/08/82- QC program was expanded to include Gran acidity for which the reporting units are ug/L as H.

01/05/83- System was fully automated by introduction of a sampler, and an automated device for washing the electrode between analyses.

01/06/84- Normality of KHP used to standardize the base was reduced from 0.005N to 0.0005N

ACIDITY - GRAN
QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 4.7 to 1000 ueq/L as H

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	148	500	501	1	6.5
b :	148	200	206	6	3.5
a+b :	148	700	707	7	9.2
a-b :	148	300	295	-5	5.0

s.d.(AB): Sw(within run): 3.5 S(between runs): 5.2 S/Sw: 1.48

On any given day the calibration is accepted if the values obtained lie within the ranges:

655 to 745 for A+B
 270 to 330 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	112	0.0 - 40.0	1.56	6.1
	169	40 - 100	2.2	3.2
	77	100 - 250	3.2	2.4
	14	250 - 500	16.9	5.2
	3	500 - 1000	9.3	1.5
	375	Overall	4.0	N/A

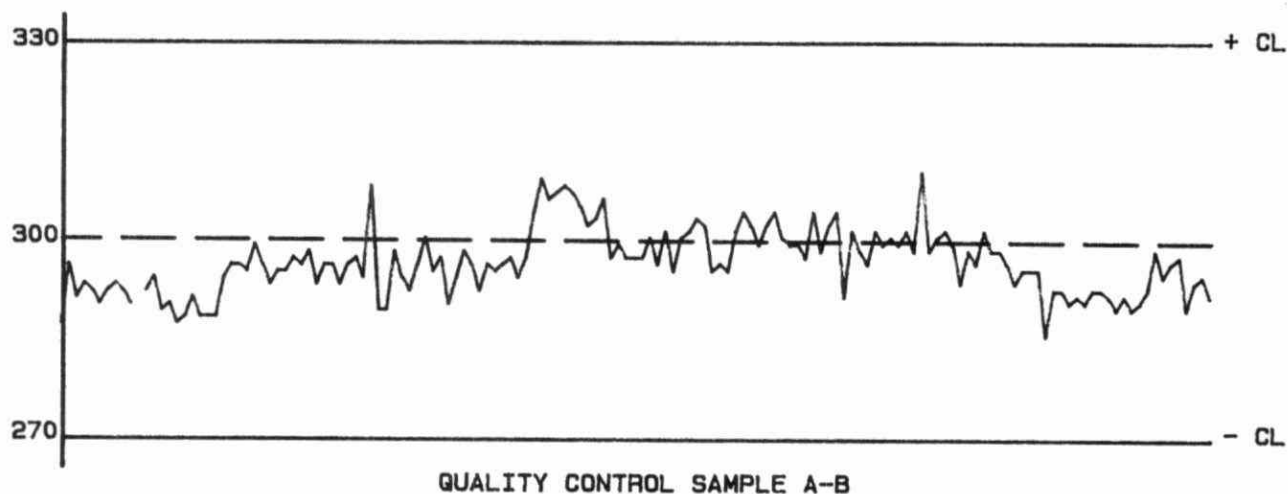
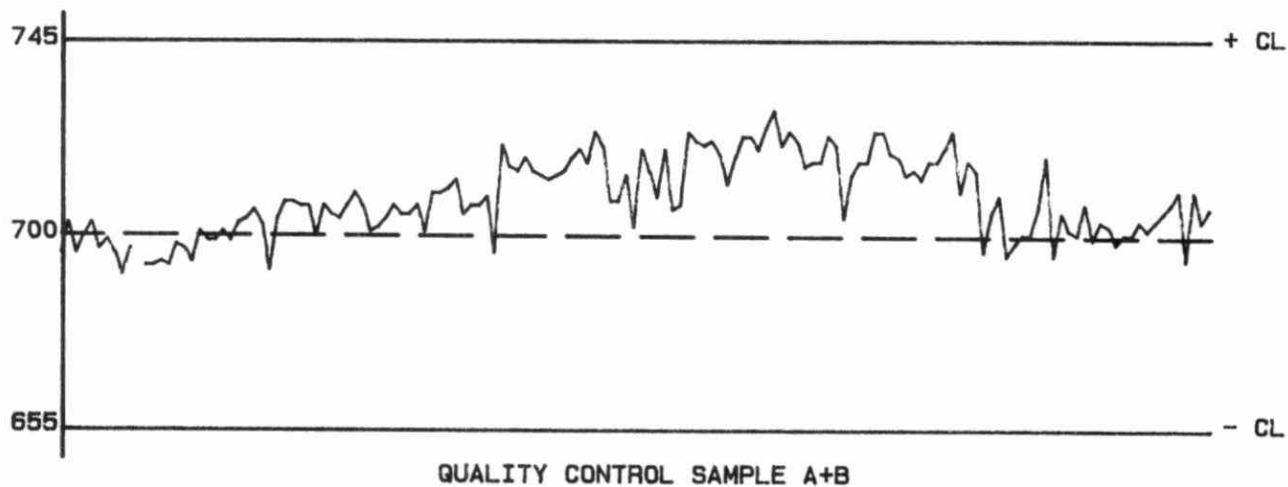
DETECTION CRITERION: 4.7

OTHER CHECKS:

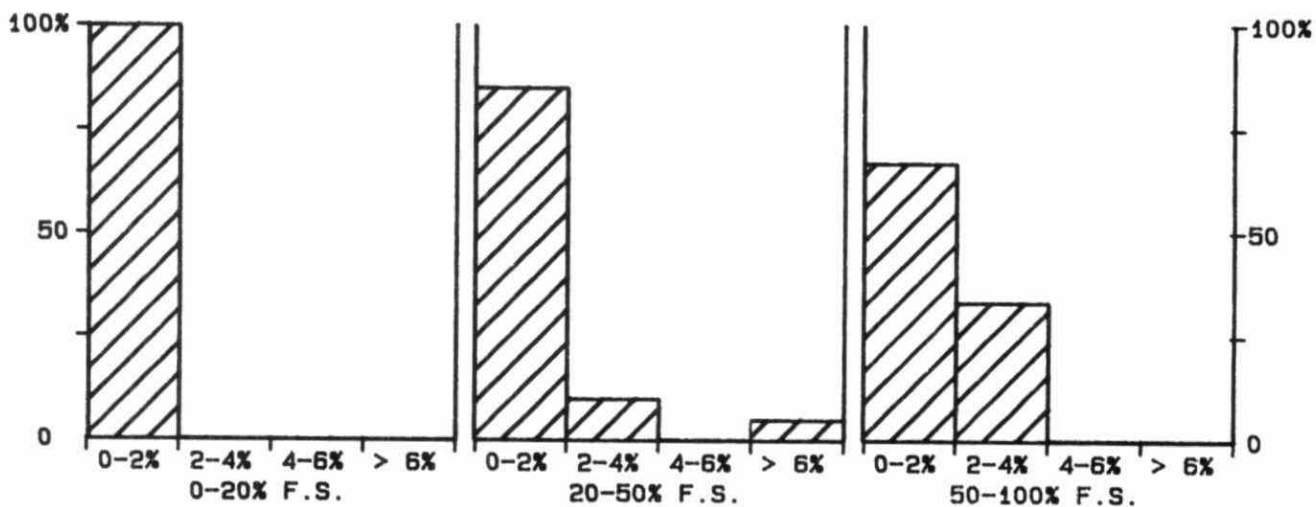
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	148	16.03	2.677

QUALITY CONTROL GRAPHS ACIDITY - GRAN (UEQ/L AS H)

FROM: 02/01/85
TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1000 UEQ/L AS H

*** ACIDITY - TOTAL FIXED ENDPOINT (TFE) ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 16/08/82
Supervisor : F. Tomassini Units : mg/L as CaCO₃
Sample Type/Matrix: Streams, Precipitation, Groundwaters

SAMPLING:

Quantity Required: 25 mL
Container : Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.01 N sodium hydroxide to a pH endpoint of 8.3. The titrant is standardized against 0.005N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. N.B. pH and Gran acidity are determined simultaneously.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.52

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration: LTBL plus 2 standards, eg, QCA
Drift : 2 standard buffers -4 times daily.

ACIDITY - TOTAL FIXED ENDPOINT
QUALITY CONTROL DATA FROM 03/01/85 TO 10/12/85

Lab: Dorset

Analytical Range: 0.52 to 50.0 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	96	25.00	25.10	0.10	0.275
b :	95	10.20	10.10	-0.10	0.229
a+b :	95	35.20	35.20	0.00	0.361
a-b :	95	14.80	14.99	0.19	0.356

s.d.(AB): Sm(within run): 0.252 S(between runs): 0.253 S/Sm: 1.01

On any given day the calibration is accepted if the values obtained lie within the ranges:

32.95 to 37.45 for A+B
 13.30 to 16.30 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	19	0.00 - 2.00	0.174	12.1
	98	2.00 - 5.00	0.266	7.2
	67	5.00 - 10.00	0.816	11.7
	55	10.0 - 25.0	1.07	6.9
	10	25.0 - 50.0	2.19	6.4
	249	Overall	0.81	N/A

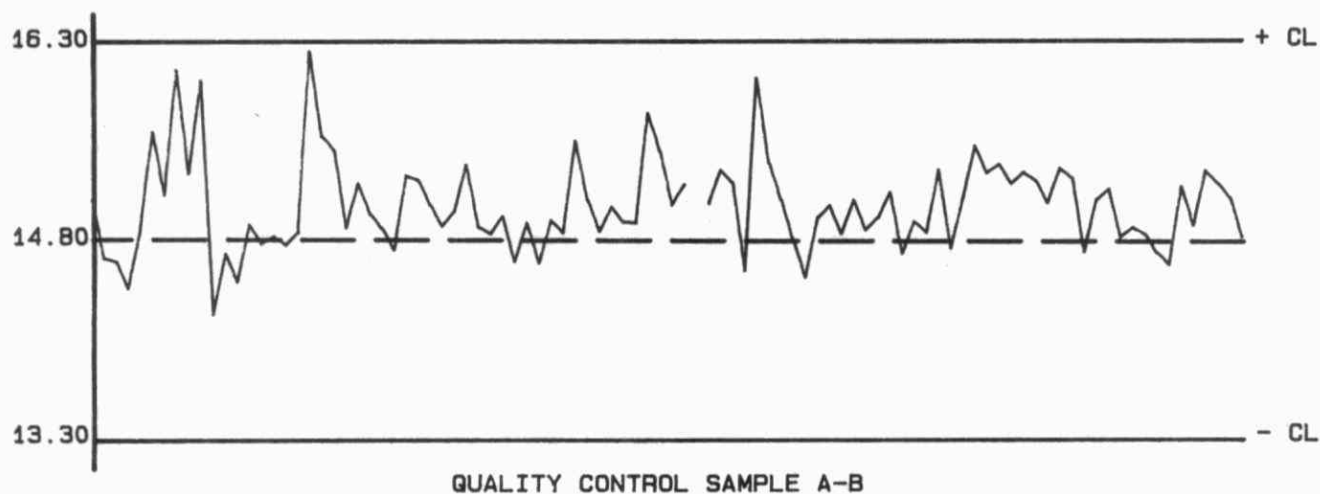
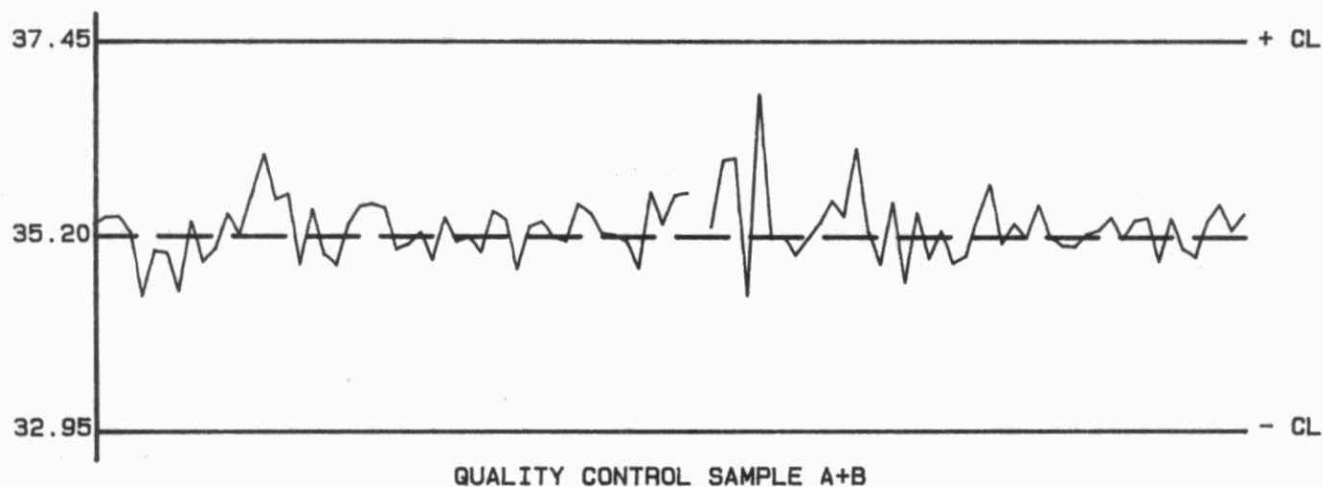
DETECTION CRITERION: 0.52

OTHER CHECKS:	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	85	0.14	0.201

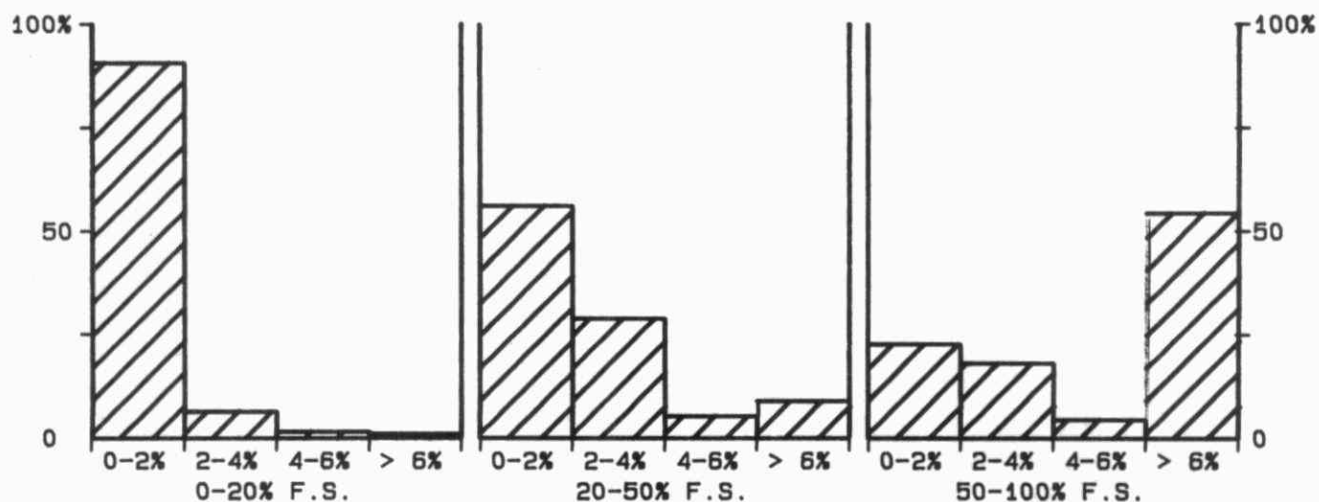
QUALITY CONTROL GRAPHS ACIDITY - TOTAL FIXED ENDPOINT (MG/L AS CaCO_3)

FROM: 03/01/85

TO: 18/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 MG/L AS CaCO_3

*** ACIDITY - TOTAL FIXED ENDPOINT (TFE) ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/05/79
LIS Test Name Code:	ACDT	Units	: mg/L as CaCO ₃
Work Station Code	: PHACD	Unit Code	: 064915
Method Code	: 001BT2	Supervisor	: M. Rawlings
Sample Type/Matrix : Precipitation, Throughfall, Stemflow, Domestic Waters, Rivers, Lakes, (by special request: Industrial Waste, Sewage)			

SAMPLING:

Quantity Required: 15 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Sample aliquots (10.0 mL) are titrated in an automated system with 0.01N sodium hydroxide to a pH endpoint of 8.3. The titrant is standardized by titrating 0.0005N potassium hydrogen phthalate to the pH endpoint of 8.3. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. N.B. pH and Gran acidity are determined simultaneously

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.24

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration : LTBL plus two standards, eg, QCA

MODIFICATIONS:

01/04/82- Sample volume was decreased from 100.0 to 10.0 mL.
01/05/83- System was fully automated by introduction of a sampler, and an automated device for washing the electrode between analyses.
01/06/84- Normality of KHP used to standardize base was reduced from 0.005N to 0.0005N.

NOTES:

Due to the instability of the QC standards at these concentration levels, calibration control limits are based on measured averages rather than theoretical concentrations.

ACIDITY - TOTAL FIXED ENDPOINT (TFE)
QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.24 to 100.0 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	148	24.9	25.1	0.2	0.32
b :	148	10.7	10.3	-0.4	0.16
a+b :	148	35.6	35.4	-0.2	0.44
a-b :	148	14.2	14.8	0.6	0.26

s.d.(AB): Sw(within run): 0.18 S(between runs): 0.25 S/Sw: 1.38

On any given day the calibration is accepted if the values obtained lie within the ranges:

32.6 to 38.6 for A+B
 12.2 to 16.2 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	108	0.00 - 2.00	0.081	6.0
	168	2.00 - 5.00	0.099	2.9
	76	5.00 - 10.00	0.124	1.9
	20	10.0 - 25.0	0.75	5.1
	4	25.0 - 100.0	0.38	0.9
	376	Overall	0.20	N/A

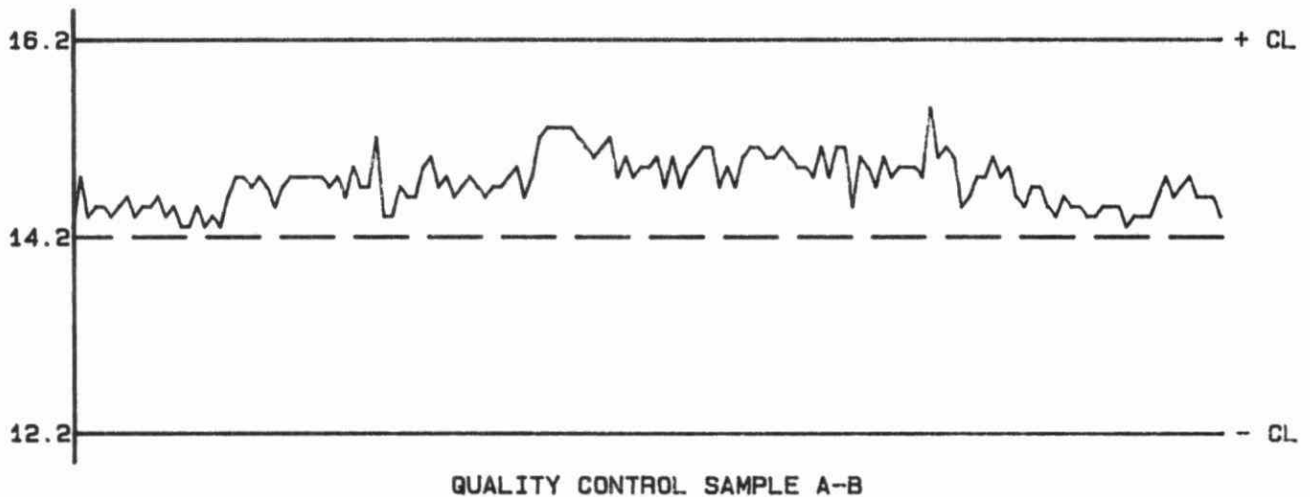
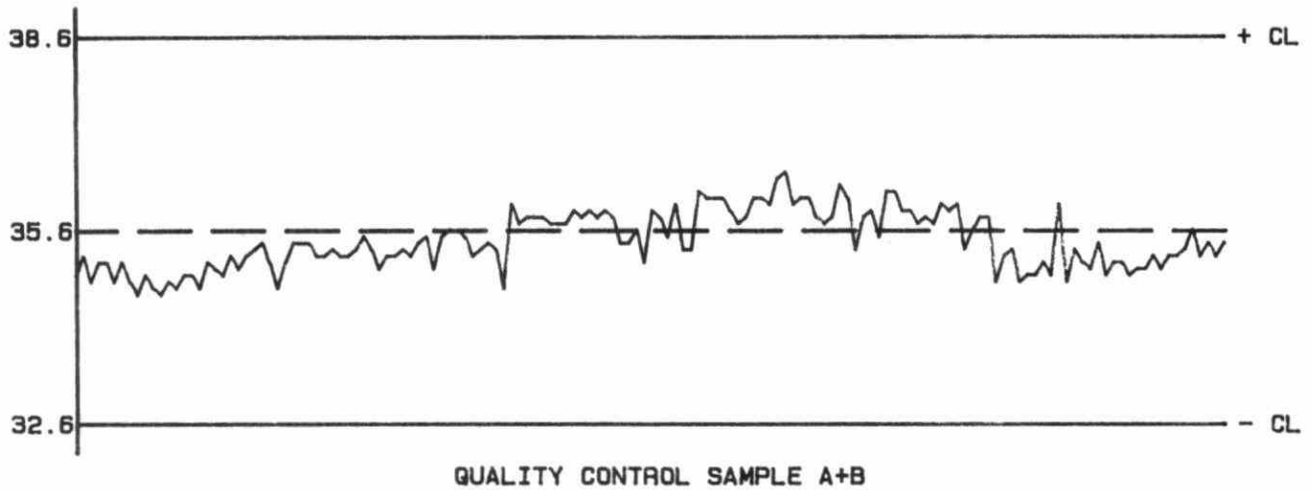
DETECTION CRITERION: 0.24

OTHER CHECKS:

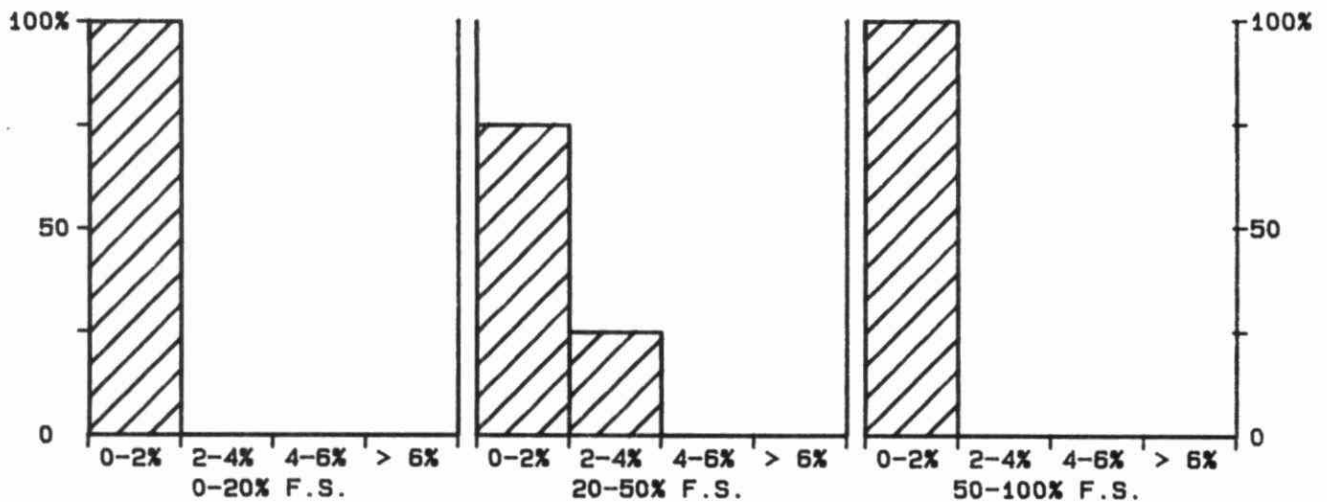
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	148	0.84	0.134

QUALITY CONTROL GRAPHS

FROM: 02/01/85

ACIDITY - TOTAL FIXED ENDPOINT (TFE) (MG/L AS CaCO_3) TO: 23/12/85

--- EXPECTED VALUE
 — CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 100 MG/L AS CaCO_3

*** ALKALINITY - GRAN ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 26/07/79
Supervisor : F. Tomassini Units : mg/L as CaCO₃
Sample Type/Matrix: Streams, Lakes, Precipitation, Groundwaters

SAMPLING:

Quantity Required: 150 mL
Container : Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH < 3.7. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. Data are subjected to Gran analysis.
N.B. pH is determined simultaneously.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration: LTBL plus 2 standards, eg, QCA.
Drift : 2 standard buffers -4 times daily.

ALKALINITY - GRAN
QUALITY CONTROL DATA FROM 03/01/85 TO 24/12/85

Lab: Dorset

Analytical Range: 0.24 to 25.00 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	268	20.20	20.18	-0.02	0.249
b :	270	4.90	4.95	0.05	0.116
a+b :	268	25.10	25.13	0.03	0.325
a-b :	268	15.30	15.23	-0.07	0.211

s.d.(AB): S_w(within run): 0.149 S(between runs): 0.194 S/S_w: 1.30

On any given day the calibration is accepted if the values obtained lie within the ranges:

23.97 to 26.22 for A+B
 14.55 to 16.05 for A-B

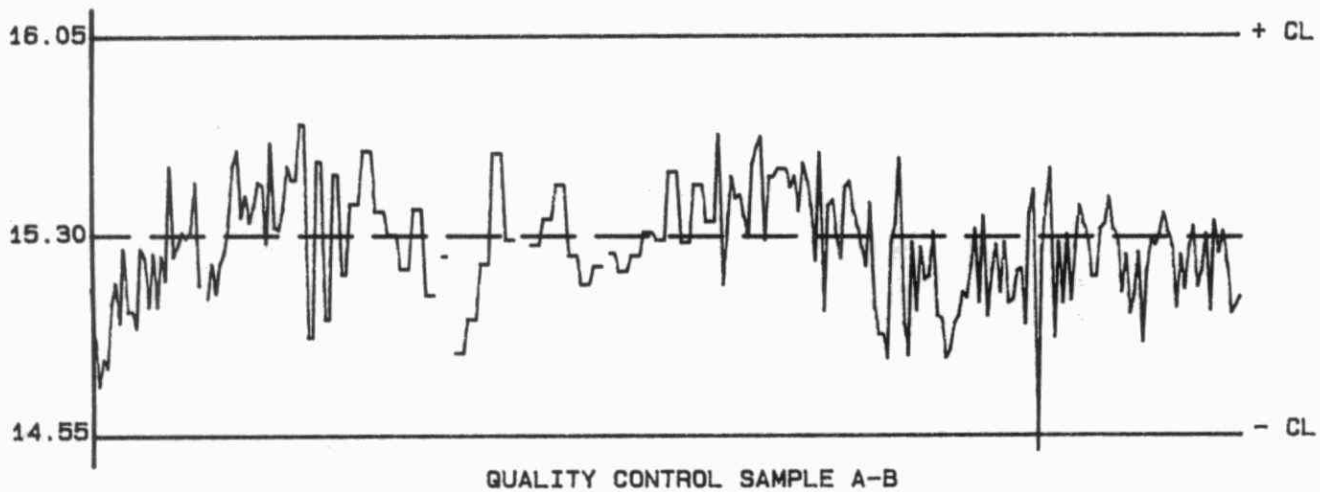
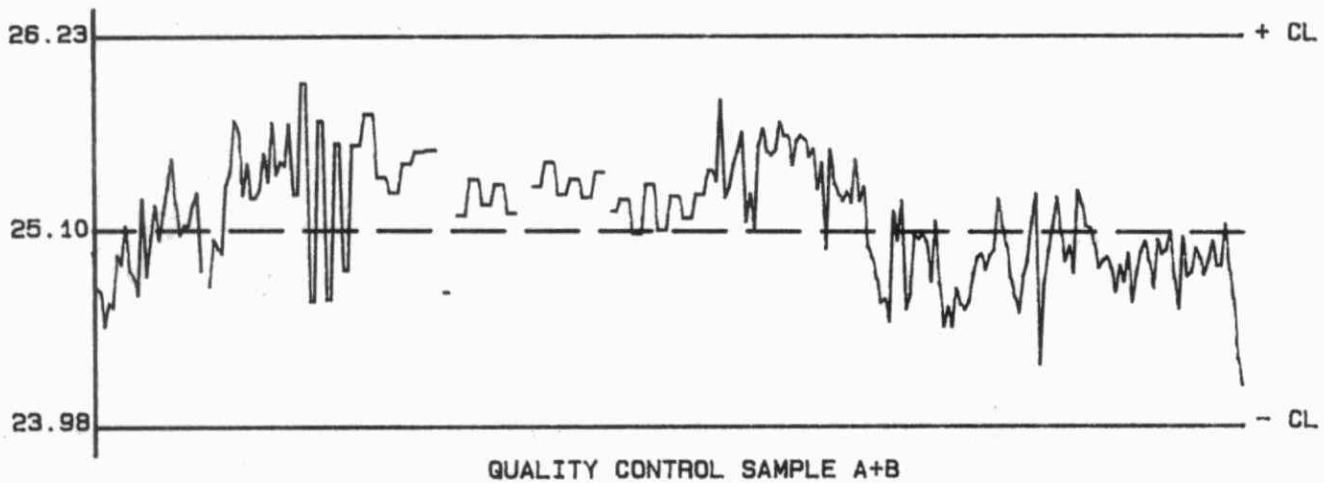
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	413	0.00 - 2.00	0.078	8.4
	233	2.00 - 5.00	0.121	3.8
	43	5.00 - 10.00	0.146	2.1
	15	10.00 - 25.00	0.155	1.0
	704	Overall	0.101	N/A

DETECTION CRITERION: 0.24**OTHER CHECKS:**

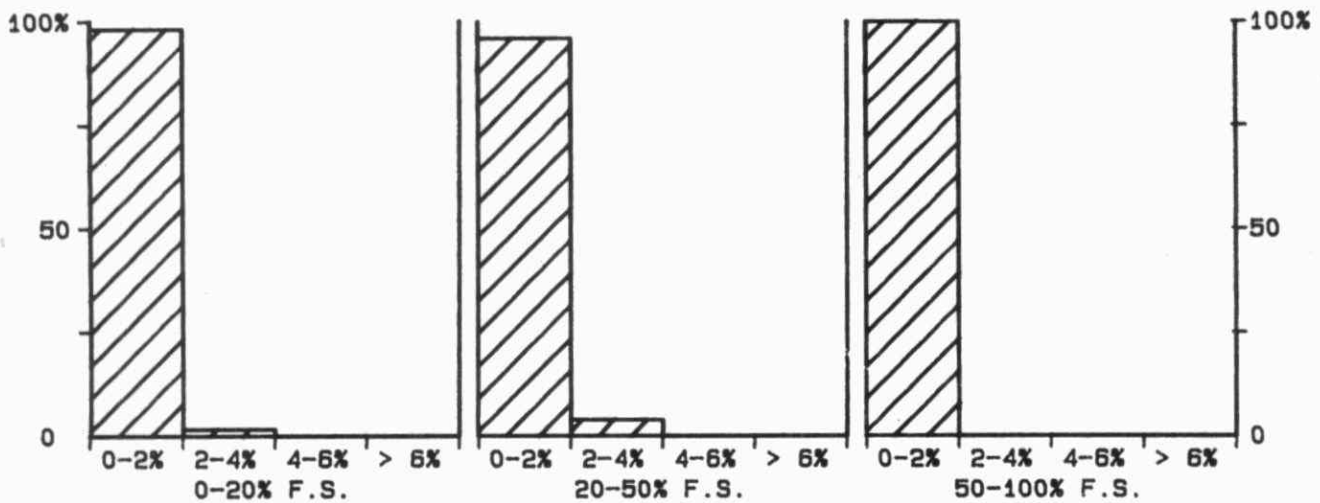
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	258	-0.07	0.089

QUALITY CONTROL GRAPHS ALKALINITY - GRAN (MG/L AS CaCO₃)

FROM: 03/01/85
TO: 24/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 25 MG/L AS CaCO₃

*** ALKALINITY - GRAN ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 09/07/80
LIS Test Name Code: ALKTI Units : mg/L as CaCO₃
Work Station Code : RMGALK,RATS Unit Code : 064915
Method Code : 004AT6 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH <4.0. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. Data are subjected to Gran analysis.

N.B. pH and total fixed endpoint alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.01

Detection Criterion (T): 0.45*

CALIBRATION:

2 standard buffers covering the pH range 4 to 7.

CONTROLS:

Calibration: LTBL plus two standards, eg, QCA.

Drift : In run standards throughout the run (diluted tap water 20% V/V).

MODIFICATIONS:

02/03/84 -QC program was expanded to include pH and total fixed endpoint alkalinity; preparation and storage of QC solutions was modified.

16/03/84 -Use of 4 oz. polyethylene bottles plus screw caps with cone-shaped liners was recommended for sampling.

09/05/85 -RATS - River Automated Titration System - designed for the determination of conductivity, pH, alkalinity - total fixed endpoint and alkalinity - Gran. The system is microcomputer controlled with data reduction and direct computer input (DCI) capabilities.

NOTES:

No data summary available for period not covered in performance report.

*Insufficient data available in lowest range to calculate T directly.

ALKALINITY-GRAN
QUALITY CONTROL DATA FROM 14/03/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: N/A to 25.00 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
c :	110	10.00	9.72	-0.28	0.308
d :	110	2.50	2.34	-0.16	0.289
c+d :	110	12.50	12.05	-0.45	0.530
c-d :	110	7.50	7.38	-0.12	0.277

s.d.(CD): Sw(within run): 0.196 S(between runs): 0.299 S/Sw: 1.52

On any given day the calibration is accepted if the values obtained lie within the ranges:

8.75 to 16.25 for C+D
 5.00 to 10.00 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	2	-2.00 - 0.00	0.135	14.0
	7	0.00 - 2.00	0.149	27.8
	15	2.00 - 5.00	0.203	6.6
	15	5.00 - 10.00	0.865	10.8
	17	10.00 - 25.00	0.706	4.0
	56	Overall	0.605	N/A

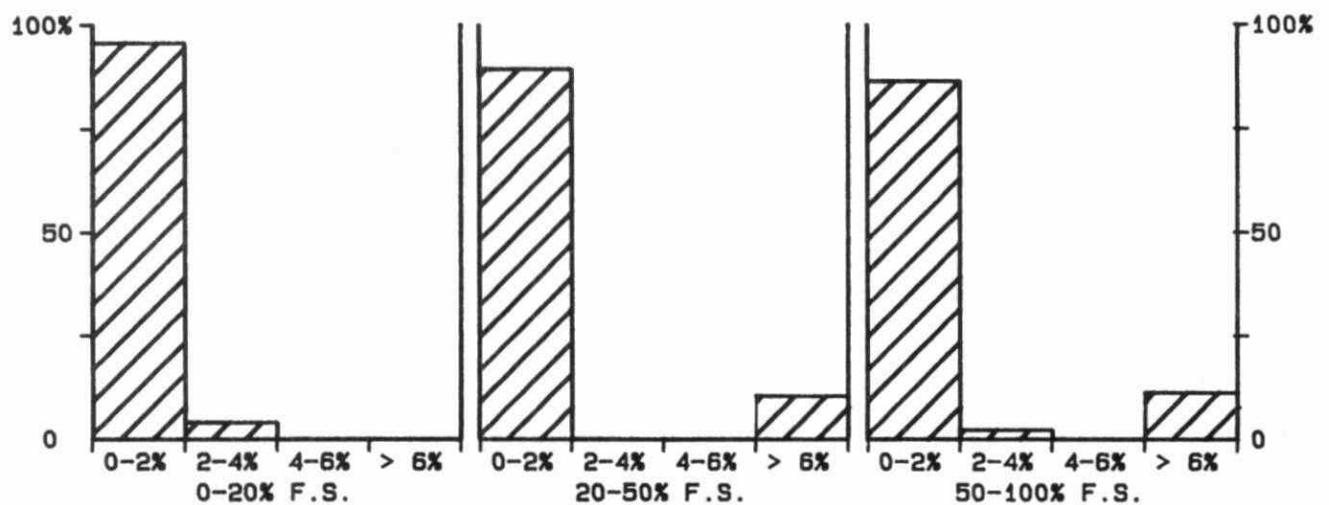
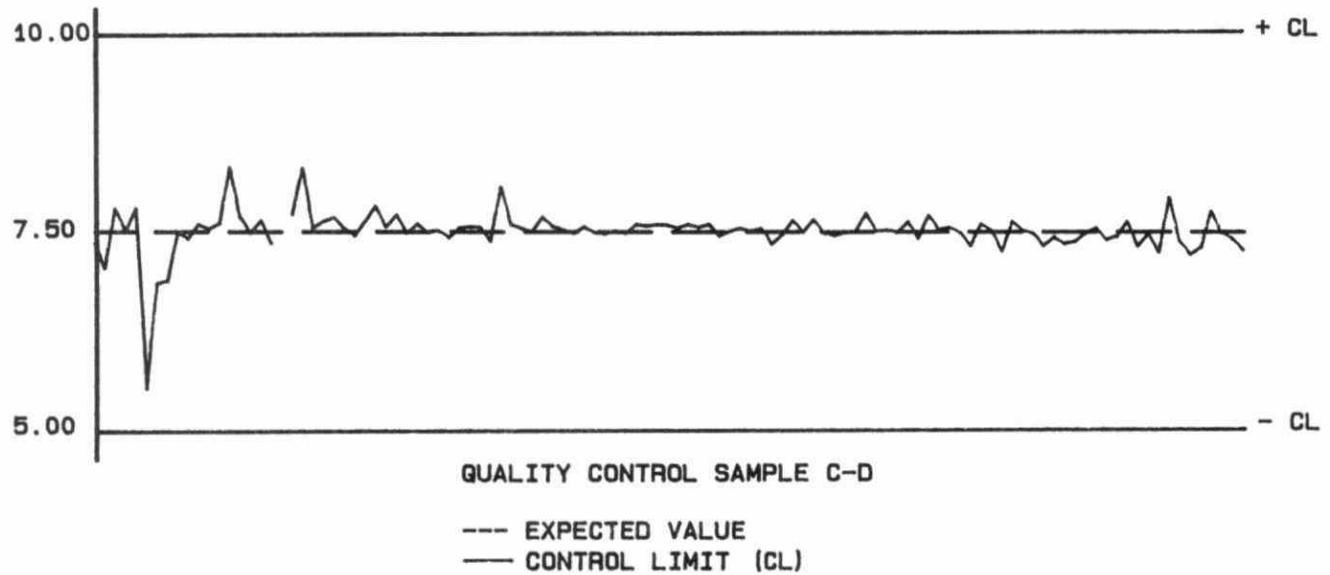
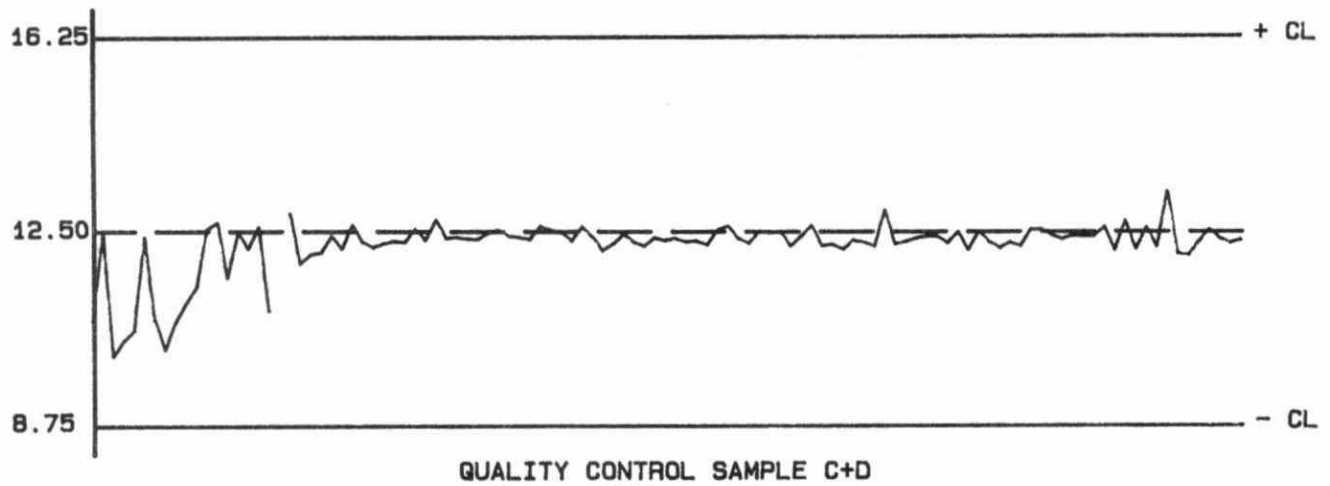
DETECTION CRITERION: N/A

OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	108	-0.03	0.308

QUALITY CONTROL GRAPHS
ALKALINITY-GRAN (MG/L AS CaCO_3)

FROM: 14/03/85
TO: 31/12/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 25 MG/L AS CaCO_3

16

*** ALKALINITY-TOTAL FIXED ENDPOINT (TFE) ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/06/65
LIS Test Name Code:	ALKT	Units	: mg/L as CaCO ₃
Work Station Code	: WALK	Unit Code	: 064915
Method Code	: 003CT3	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Sewage, Industrial Waste, Effluents			

SAMPLING:

Quantity Required: 75 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples (50.0 mL) are manually pipetted and titrated automatically with 0.02 N sulphuric acid to a pH endpoint of 4.5. Sludges are centrifuged before analysis.

INSTRUMENTATION:

- Automated Fisher Titralyzer II system.

REPORTING:

Maximum Significant Figures: 4	
Minimum Increment (W) : 0.2	Detection Criterion (T): 1.6

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration: 2 standards, eg, QCA
Drift : 1 standard

ALKALINITY-TOTAL FIXED ENDPOINT
QUALITY CONTROL DATA FROM 04/01/85 TO 31/12/85

Lab: Domestic Water

Analytical Range: 1.6 to 500 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	170	285.0	283.7	-1.3	3.32
b :	170	57.0	59.1	2.1	1.50
a+b :	170	342.0	342.8	0.8	4.56
a-b :	170	228.0	224.6	-3.4	2.40

s.d.(AB): S_w(within run): 1.70 S(between runs): 2.58 S/S_w: 1.52

On any given day the calibration is accepted if the values obtained lie within the ranges:

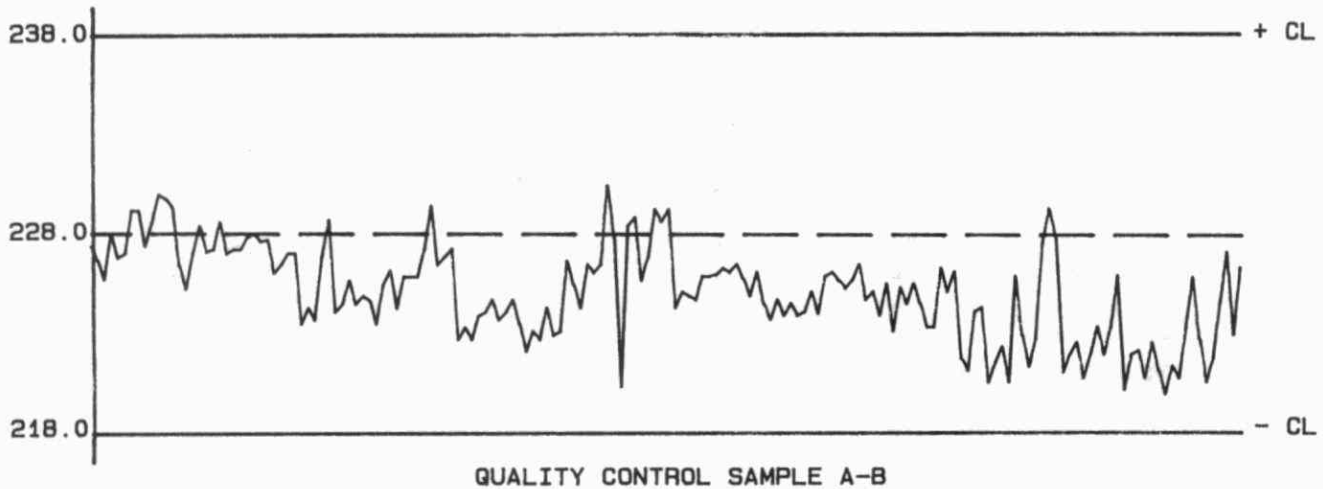
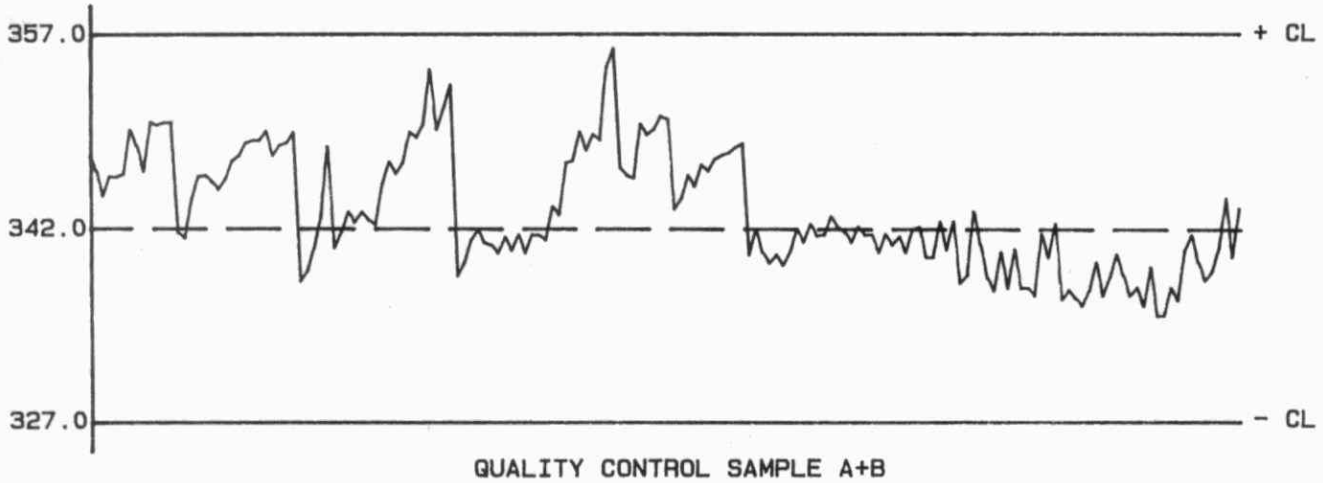
327.0 to 357.0 for A+B
 218.0 to 238.0 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	68	0.0 - 50.0	0.55	2.3
	82	50.0 - 100.0	0.33	0.4
	110	100 - 200	0.9	0.6
	152	200 - 500	1.8	0.7
	412	Overall	1.2	N/A

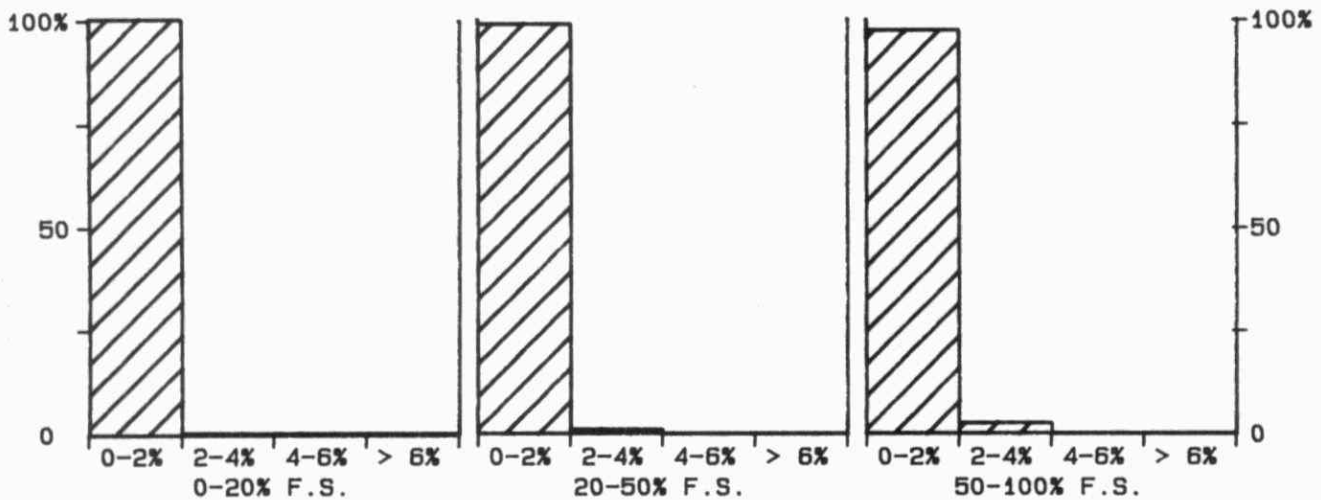
DETECTION CRITERION: 1.6

QUALITY CONTROL GRAPHS ALKALINITY-TOTAL FIXED ENDPOINT (MG/L AS CaCO_3)

FROM: 04/01/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 500 MG/L AS CaCO_3

*** ALKALINITY - TOTAL FIXED ENDPOINT (TFE) ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	09/07/80
LIS Test Name Code:	ALKT	Units	: mg/L as CaCO ₃
Work Station Code	: RMGALK,RATS	Unit Code	: 064915
Method Code	: 004AT6	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation			

SAMPLING:

Quantity Required: 50 mL
 Container : Polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.020 N sulphuric acid to a pH endpoint of 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. N.B. pH and Gran alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 4
 Minimum Increment (W) : 0.01 Detection Criterion (T): 0.78

CALIBRATION:

2 standard buffers covering the pH range 4 to 7.

CONTROLS:

Calibration: LTBL plus 4 standards, eg, QCA.

Drift : In run standards through out the run. Diluted tap water (20% V/V)

MODIFICATIONS:

02/03/84- QC program was expanded to include pH and total fixed endpoint alkalinity; preparation and storage of QC solutions was modified.

16/03/84- Use of 4 oz. polyethylene bottles plus screw caps with cone-shaped liners was recommended for sampling.

09/05/85- RATS- River Automated Titration System - designed for the determination of conductivity, pH, alkalinity - total fixed endpoint and alkalinity - Gran. The system is microcomputer controlled with data reduction and direct computer (DCI) capabilities.

NOTES:

Control limits were set widely since the performance of the new RATS system was unknown.

No data summary is available for the period not covered in performance report.

ALKALINITY-TFE
QUALITY CONTROL DATA FROM 03/05/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: 0.78 to 250 mg/L as CaCO₃**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard (1) Deviation
<hr/>					
a :	97	250.0	249.8	-0.2	1.79
b :	97	50.0	50.1	0.1	1.09
a+b :	97	300.0	299.9	-0.1	2.62
a-b :	97	200.0	199.7	-0.3	1.40
c :	93	10.00	9.76	-0.24	0.175
d :	93	2.50	2.21	-0.29	0.193
c+d :	93	12.50	11.97	-0.53	0.277
c-d :	93	7.50	7.55	0.05	0.242

s.d.(AB): Sw(within run): 0.99 S(between runs): 1.48 S/Sw: 1.50
s.d.(CD): Sw(within run): 0.171 S(between runs): 0.184 S/Sw: 1.08

On any given day the calibration is accepted if the values obtained lie within the ranges:

288.8 to 311.2 for A+B
192.5 to 207.5 for A-B
8.75 to 16.25 for C+D
5.00 to 10.00 for C-D

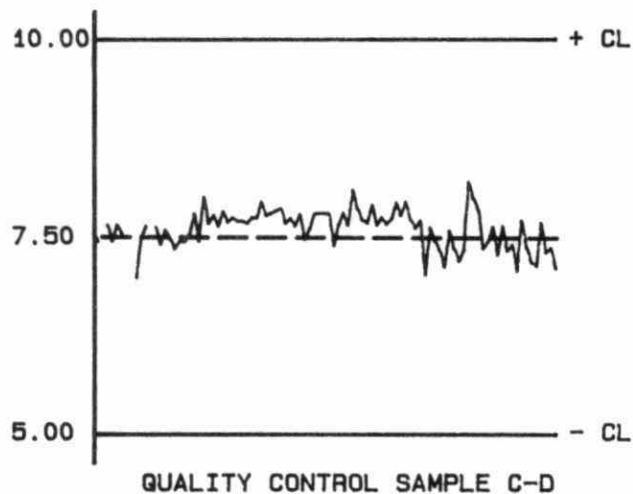
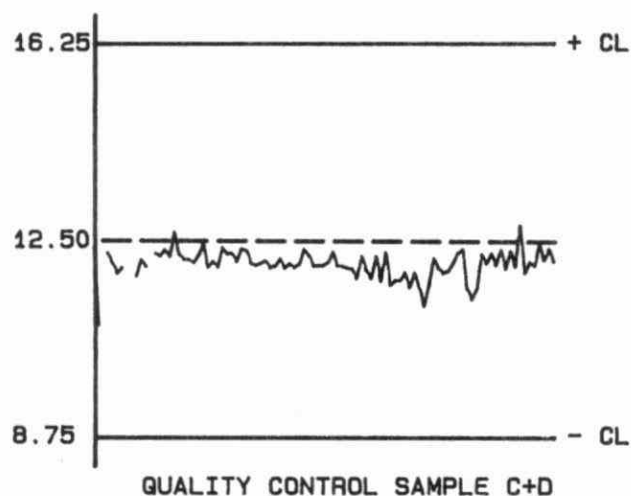
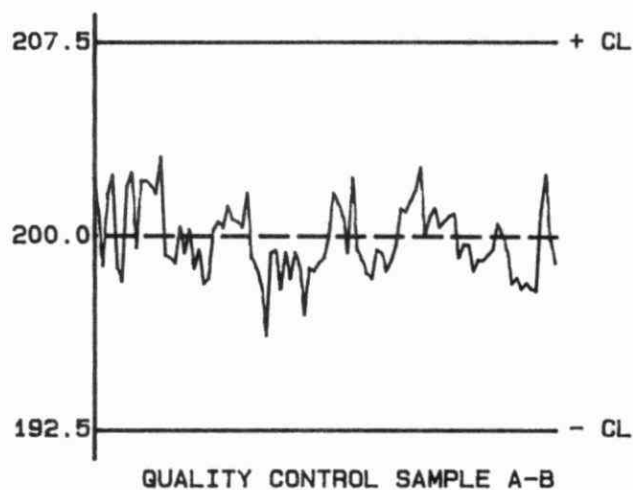
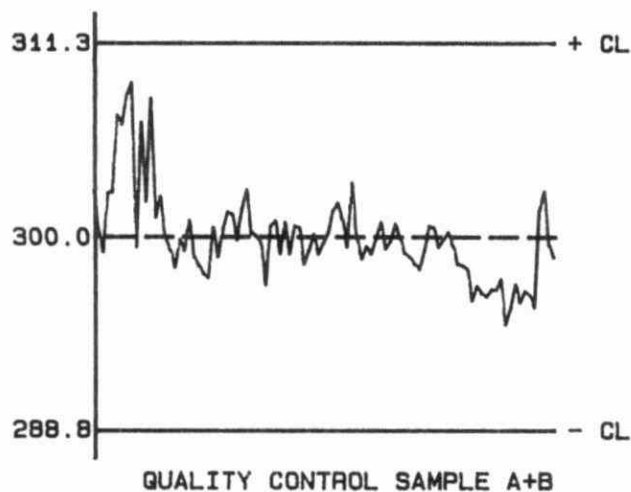
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean (2) s.d.	Coefficient of var. (%)
<hr/>				
	34	0.00 - 5.00	0.261	8.9
	23	5.00 - 10.00	0.270	3.7
	47	10.00 - 25.00	0.510	3.1
	81	25.0 - 100.0	0.60	0.9
	74	100 - 250	0.9	0.5
	259	Overall	0.6	N/A

DETECTION CRITERION: 0.78**OTHER CHECKS:**

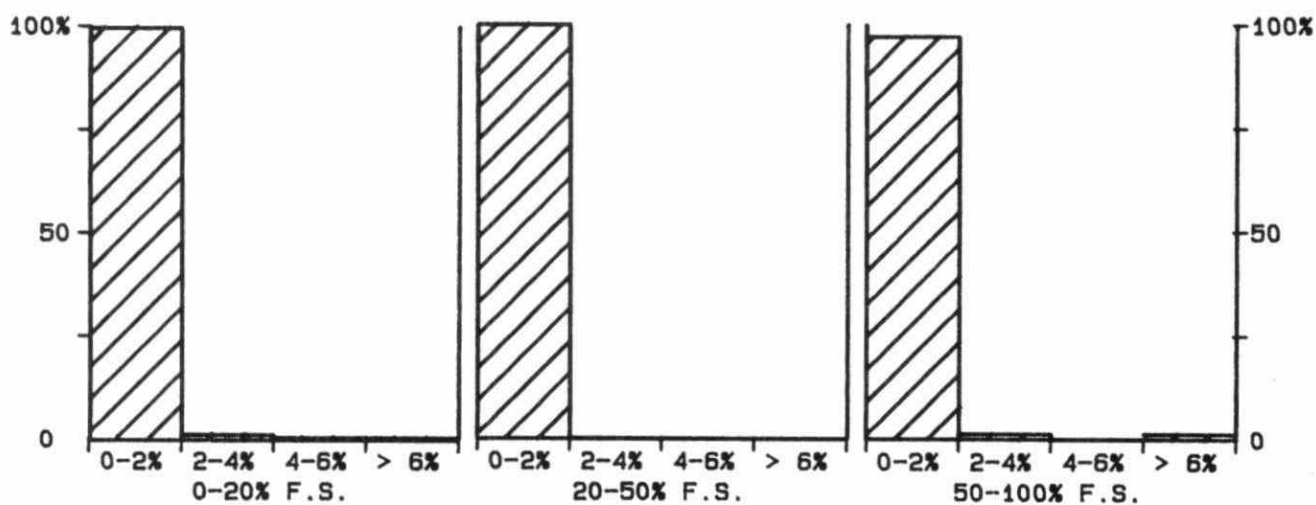
	Number of Data	Data Mean	Standard (1) Deviation
<hr/>			
Long Term Blank :	94	1.82	0.098

QUALITY CONTROL GRAPHS ALKALINITY-TFE (MG/L AS CaCO_3)

FROM: 03/05/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 250 MG/L AS CaCO_3

*** CALCIUM ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/06/82
LIS Test Name Code:	CAUR	Units	: mg/L as Ca
Work Station Code	: WCAMGH	Unit Code	: 064820
Method Code	: 002AA1	Supervisor	: M.Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Effluents, Sewage			

SAMPLING:

Quantity Required: 100 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm using an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.16 at the 50 mg/L as Ca level.

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS). Two analytical ranges are obtained from the output of the AAS.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.1 Detection Criterion (T): 0.9

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : BL plus 3 standards

MODIFICATIONS:

01/07/82- The method introduced on this date differed slightly from Method B for calcium in HAMES in that full scale for the analytical range was 50.0 mg/L; concentrations for the QC standards were also adjusted.

CALCIUM
QUALITY CONTROL DATA FROM 07/01/85 TO 30/12/85

Lab: Domestic Water

Analytical Range: 0.9 to 200 mg/L as Ca

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	130	130	131	1	1.4
b :	130	33	33	0	1.1
a+b :	130	163	164	1	1.7
a-b :	130	97	99	2	1.8
c :	130	32.5	32.7	0.2	0.60
d :	130	6.5	6.5	0.0	0.25
c+d :	130	39.0	39.2	0.2	0.71
c-d :	130	26.0	26.3	0.3	0.58

s.d.(AB): Sw(within run): 1.3 S(between runs): 1.3 S/Sw: 0.99
 s.d.(CD): Sw(within run): 0.41 S(between runs): 0.46 S/Sw: 1.12

On any given day the calibration is accepted if the values obtained lie within the ranges:

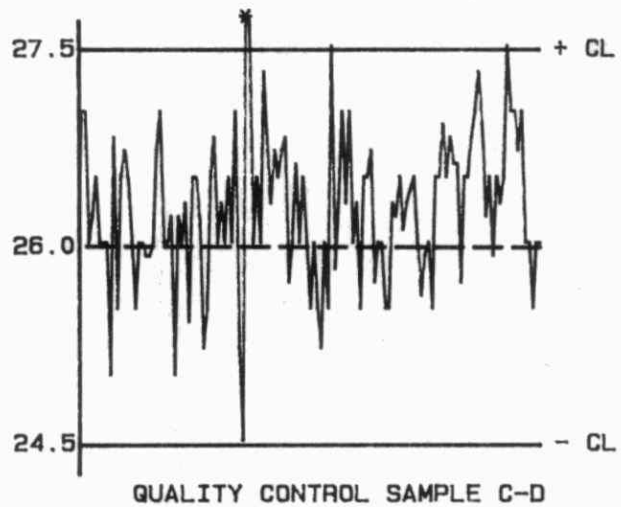
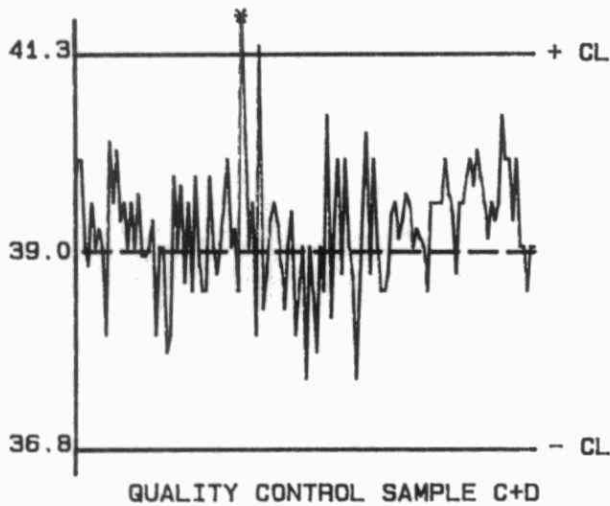
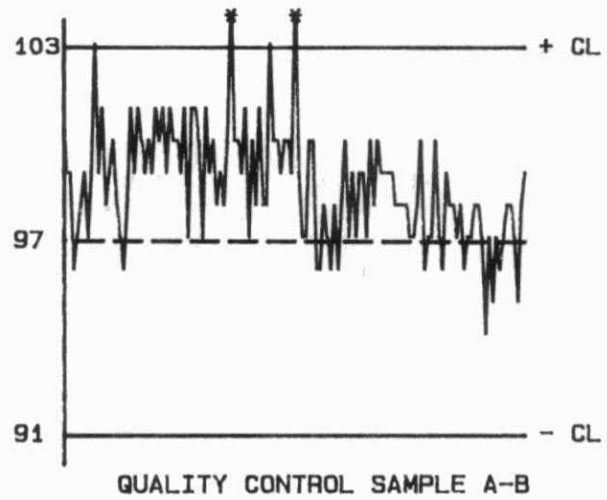
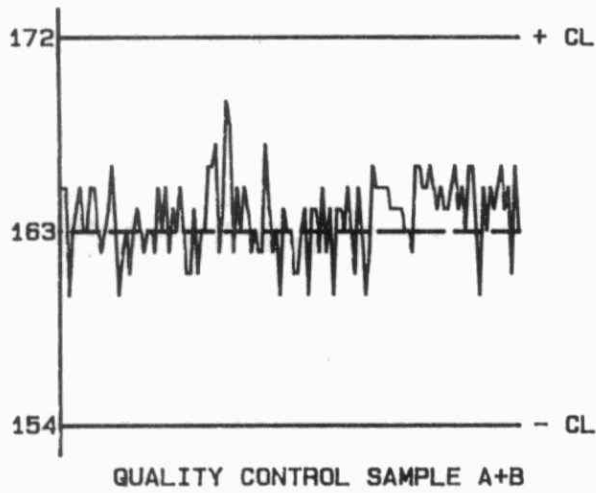
154 to 172 for A+B
 91 to 103 for A-B
 36.8 to 41.2 for C+D
 24.5 to 27.5 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	35	0.0 - 10.0	0.28	7.0
	33	10.0 - 20.0	0.55	3.7
	111	20.0 - 50.0	0.83	2.3
	132	50 - 100	1.2	1.6
	53	100 - 200	1.7	1.3
	364	Overall	1.1	N/A

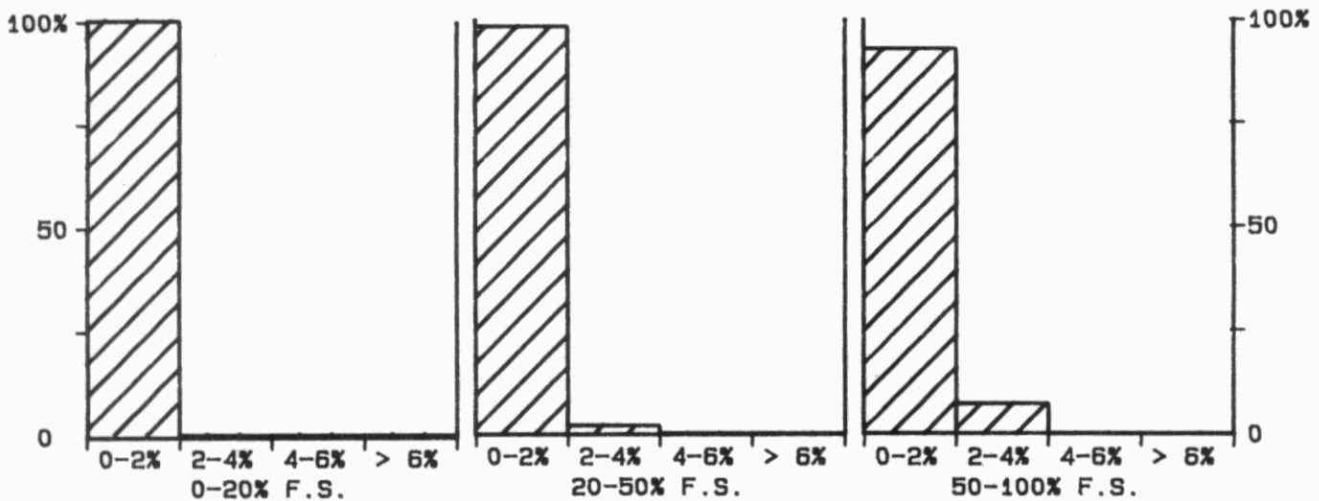
DETECTION CRITERION: 0.9

QUALITY CONTROL GRAPHS CALCIUM (MG/L AS CA)

FROM: 07/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



*** 25 CALCIUM ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	18/05/79
LIS Test Name Code:	CAUR	Units	: mg/L as Ca
Work Station Code	: PRAA	Unit Code	: 064820
Method Code	: 002CA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow.			

SAMPLING:

Quantity Required: 5 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Samples are analysed by AAS at 422.7 nm with an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.
Approximate absorbance: 0.2 at the 2.00 mg/L level.

INSTRUMENTATION:

Automated modular flow injection atomic absorption spectrophotometer (AAS) system

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.08

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL every 10 samples plus 2 standards every 20 samples.

MODIFICATIONS:

- 17/05/85 - Three additional calibration standards were set up.
- Flow Injection introduction of sample was adopted.
- System was further automated with the addition of a microcomputer to co-ordinate sampler, injection, AAS "read", and data reduction.
- Sample required reduced to 5 mL.

CALCIUM
QUALITY CONTROL DATA FROM 08/01/85 TO 20/12/85

Lab: Precipitation

Analytical Range: 0.08 to 2.00 mg/L as Ca

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	66	1.20	1.19	-0.01	0.028
b :	67	0.20	0.20	-0.00	0.026
a+b :	64	1.40	1.39	-0.01	0.041
a-b :	64	1.00	0.99	-0.01	0.035

s.d.(AB): Sm(within run): 0.025 S(between runs): 0.027 S/Sm: 1.09

On any given day the calibration is accepted if the values obtained lie within the ranges:

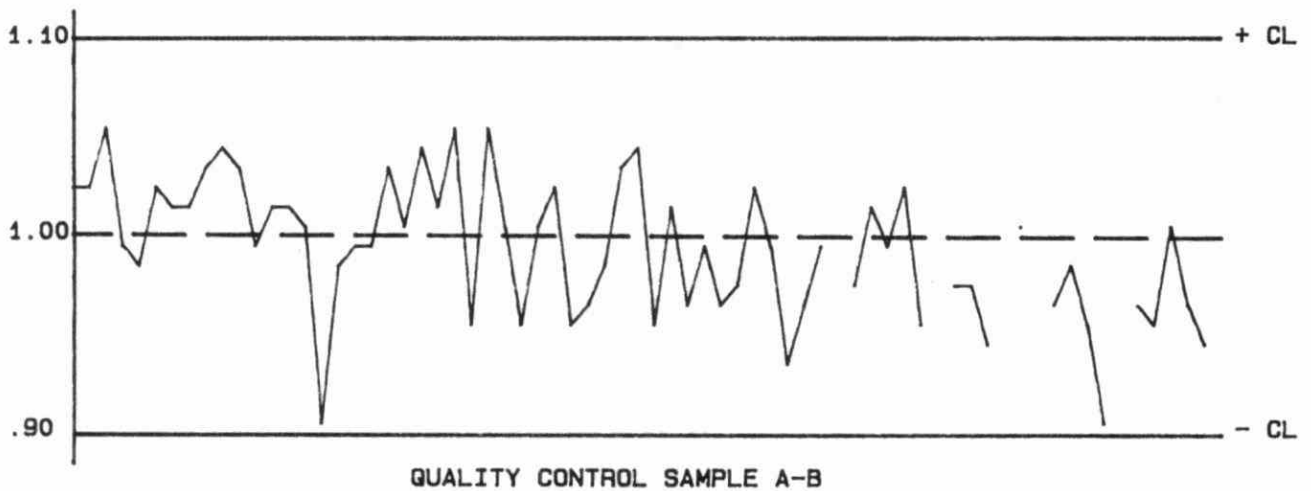
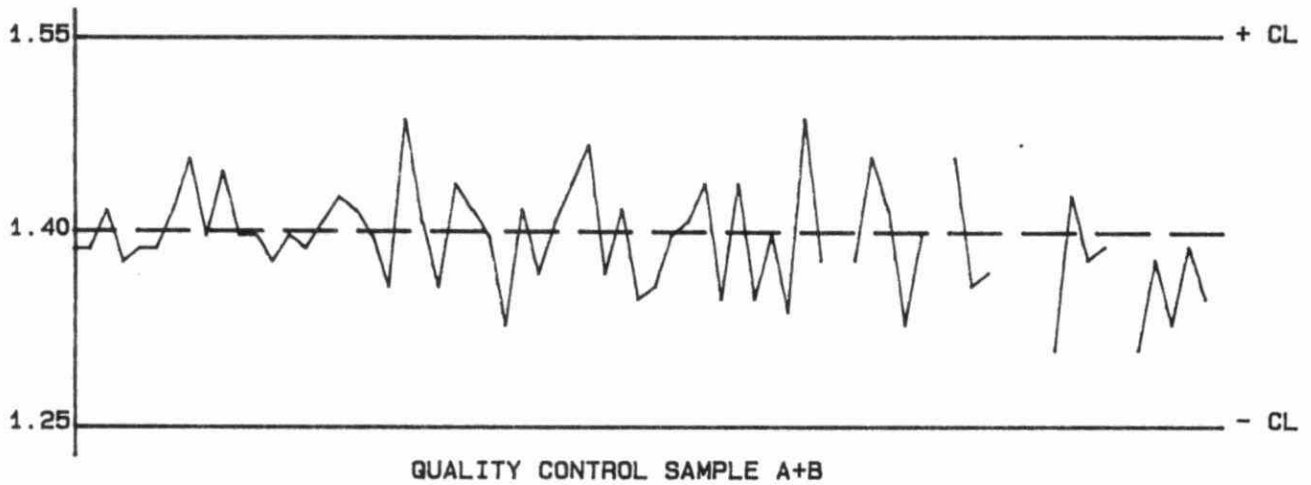
1.25 to 1.55 for A+B
 0.90 to 1.10 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	56	0.00 - 0.20	0.025	25.4
	54	0.20 - 0.50	0.029	9.0
	21	0.50 - 1.00	0.038	5.3
	18	1.00 - 2.00	0.026	2.0
	149	Overall	0.029	N/A

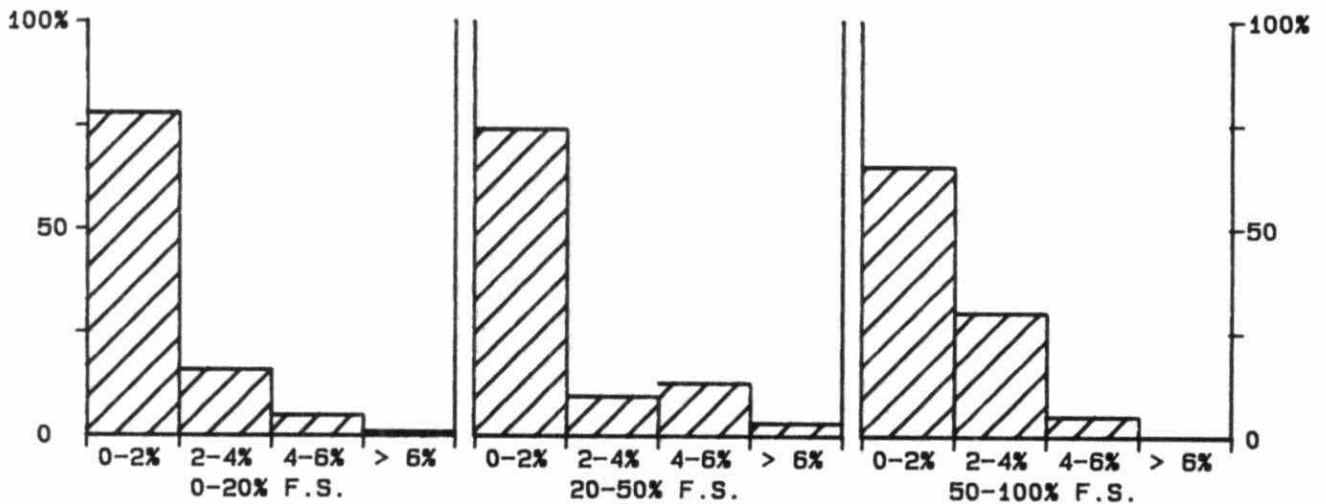
DETECTION CRITERION: 0.08

QUALITY CONTROL GRAPHS CALCIUM (MG/L AS CA)

FROM: 08/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS CA

*** CALCIUM ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	CAUR	Units	: mg/L as Ca
Work Station Code	: RMAAS	Unit Code	: 064820
Method Code	: 002AA1,002BA1	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts, Effluents.		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm using an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: RMAAS: 1.4, full scale value

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS).

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T):0.28*,0.33,0.6

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA for each analytical range
Drift : BL plus 1 standard for each analytical range

MODIFICATIONS:

01/12/81- Calibration range became 20.0 mg/L full scale; second analytical range was dropped.

01/03/84- Analytical range(RMCAMGL) was added; full scale:5.00 mg/L. This range is currently restricted to special programs.

01/09/84- Analytical range(RMCAMGH) was increased from 20.0 to 50.0 mg/L full scale. Calibration technique was changed from quadratic to linear interpolation. Magnesium is no longer determined simultaneously.

25/09/85- Calibration range became 35.0 mg/L full scale; second analytical range was dropped. Microcomputer controlled system.

NOTES:

Three analytical ranges were used during 1985: 5, 35, and 50 mg/L as Ca full scale. Detection criteria reported above correspond to these ranges respectively.

*T value is based on duplicate analyses at concentrations above the lowest range.

CALCIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 09/09/85

Lab: Rivers and Lakes

Analytical Range: 0.6 to 50.0 mg/L as Ca

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	40	37.5	37.8	0.3	0.61
b :	40	12.5	12.7	0.2	0.21
a+b :	40	50.0	50.5	0.5	0.67
a-b :	40	25.0	25.1	0.1	0.63

s.d.(AB): Sw(within run): 0.45 S(between runs): 0.46 S/Sw: 1.02

On any given day the calibration is accepted if the values obtained lie within the ranges:

47.8 to 52.2 for A+B
 23.5 to 26.5 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	9	0.0 - 2.0	0.20	15.7
	38	2.0 - 5.0	0.36	12.1
	11	5.0 - 10.0	0.29	4.2
	17	10.0 - 20.0	0.46	3.2
	20	20.0 - 50.0	0.57	1.7
	95	Overall	0.41	N/A

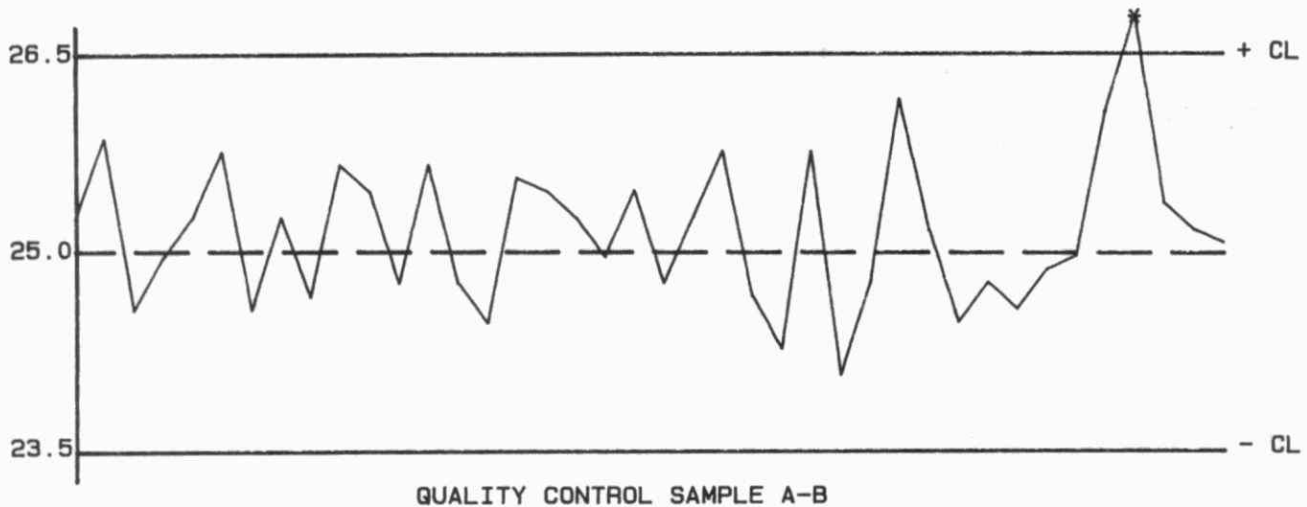
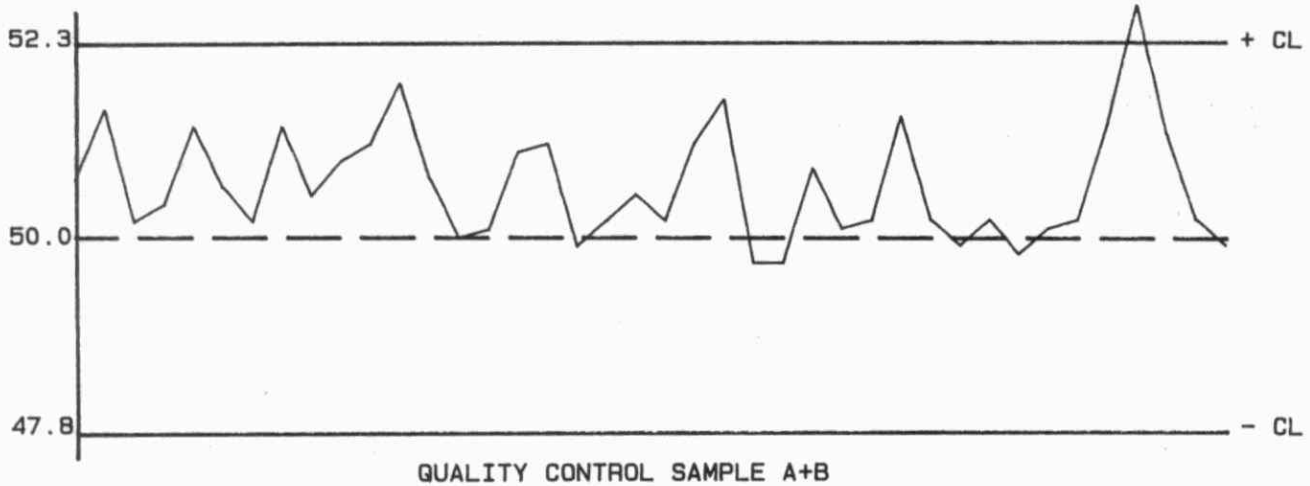
DETECTION CRITERION: 0.6

OTHER CHECKS:

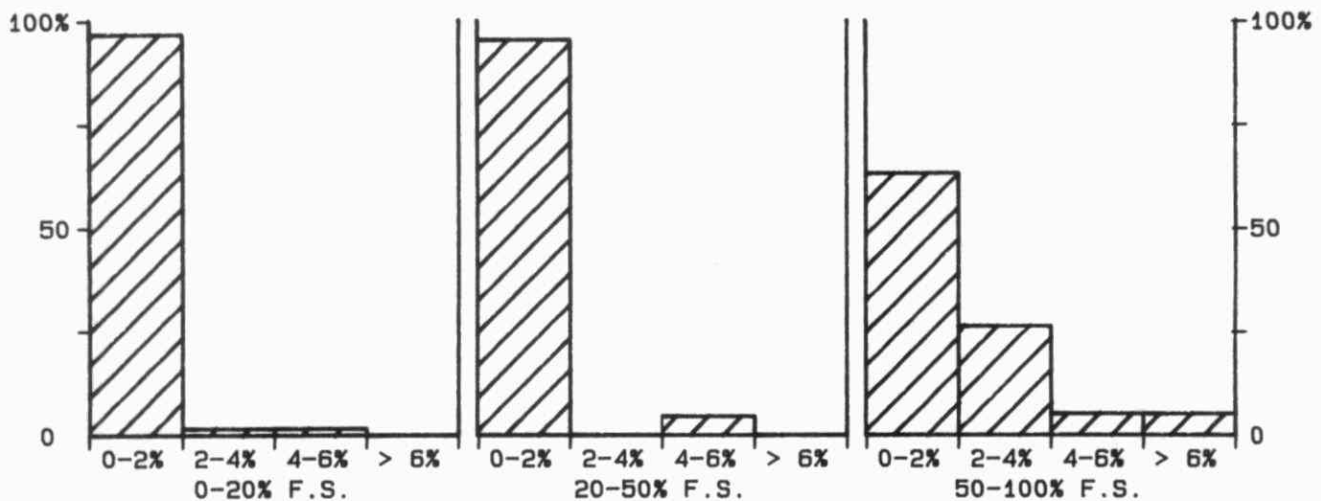
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	30	1.08	0.134
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS CALCIUM (MG/L AS CA)

FROM: 03/01/85
TO: 09/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 MG/L AS CA

CALCIUM
QUALITY CONTROL DATA FROM 26/09/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.33 to 35.00 mg/L as Ca

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	28	28.00	28.09	0.09	0.325
b :	28	2.45	2.49	0.04	0.057
a+b :	28	30.45	30.58	0.13	0.363
a-b :	28	25.55	25.60	0.05	0.294

s.d.(AB): Sw(within run): 0.208 S(between runs): 0.233 S/Sw: 1.12

On any given day the calibration is accepted if the values obtained lie within the ranges:

28.87 to 32.02 for A+B
 24.50 to 26.60 for A-B

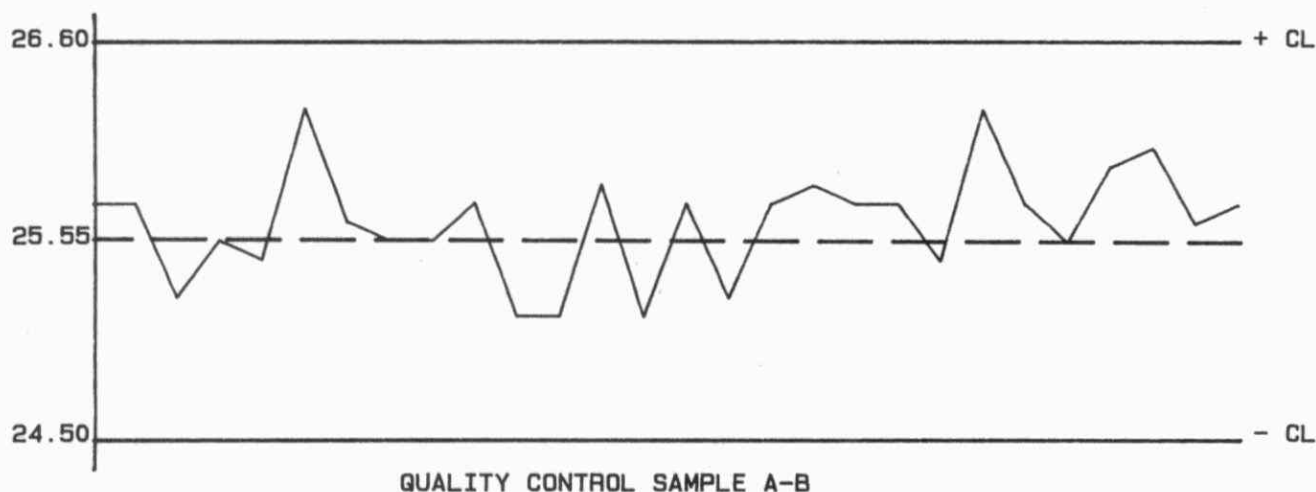
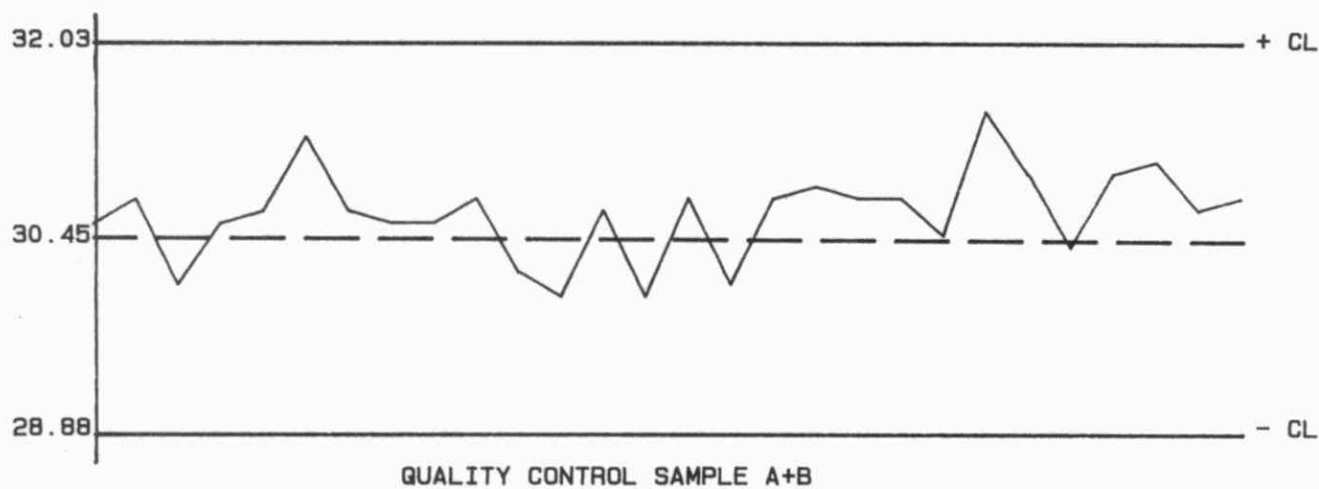
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	7	0.00 - 1.75	0.110	6.7
	46	1.75 - 3.50	0.165	6.5
	10	3.50 - 7.00	0.315	6.8
	14	7.00 - 17.50	0.333	3.2
	1	17.50 - 35.00	N/A	N/A
	78	Overall	0.228	N/A

DETECTION CRITERION: 0.33**OTHER CHECKS:**

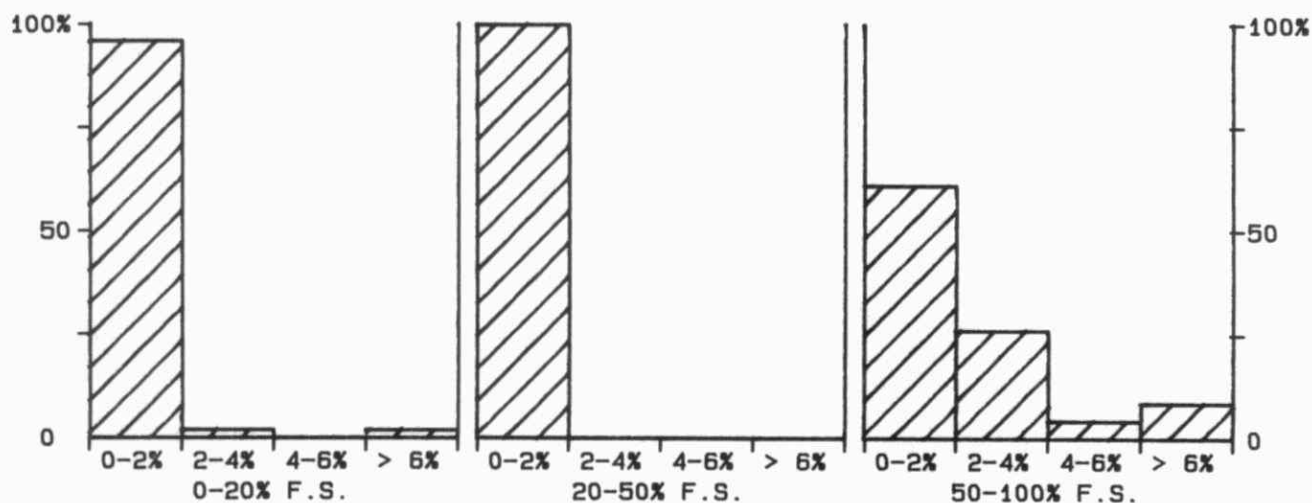
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	0	N/A	N/A
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS CALCIUM (MG/L AS CA)

FROM: 25/09/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 35 MG/L AS CA

CALCIUM
QUALITY CONTROL DATA FROM 07/01/85 TO 10/09/85

Lab: Rivers and Lakes

Analytical Range: N/A to 5.00 mg/L as Ca

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	49	3.75	3.76	0.01	0.057
b :	49	1.25	1.24	-0.01	0.035
a+b :	49	5.00	5.01	0.01	0.076
a-b :	49	2.50	2.52	0.02	0.057

s.d.(AB): Sw(within run): 0.040 S(between runs): 0.047 S/Sw: 1.17

On any given day the calibration is accepted if the values obtained lie within the ranges:

4.77 to 5.23 for A+B
 2.35 to 2.65 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	0	0.00 - 1.00	N/A	N/A
	15	1.00 - 2.00	0.094	5.5
	65	2.00 - 3.00	0.116	4.7
	49	3.00 - 5.00	0.090	2.4
	129	Overall	0.105	N/A

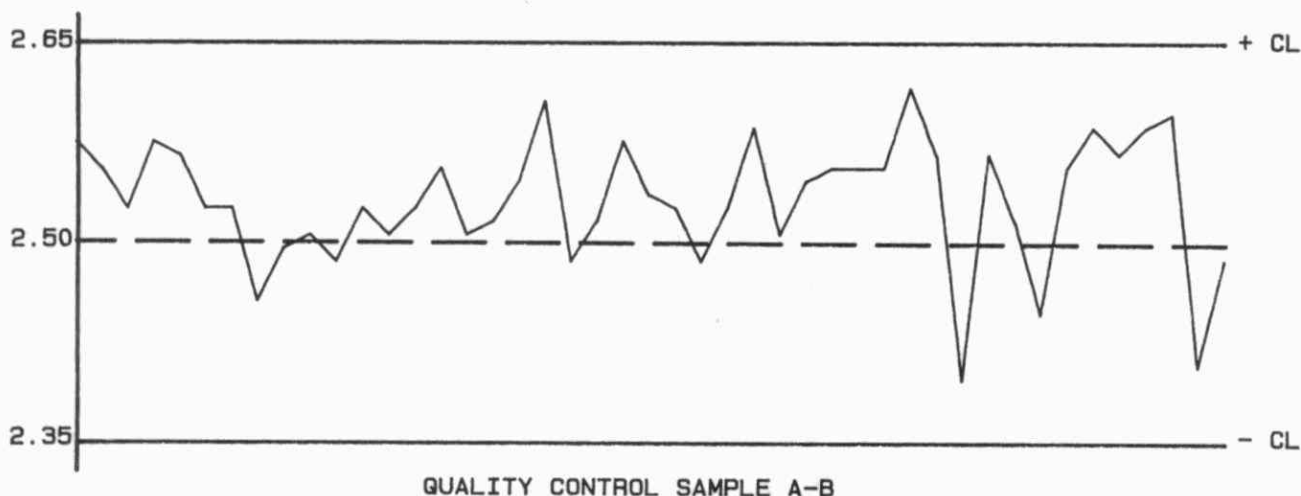
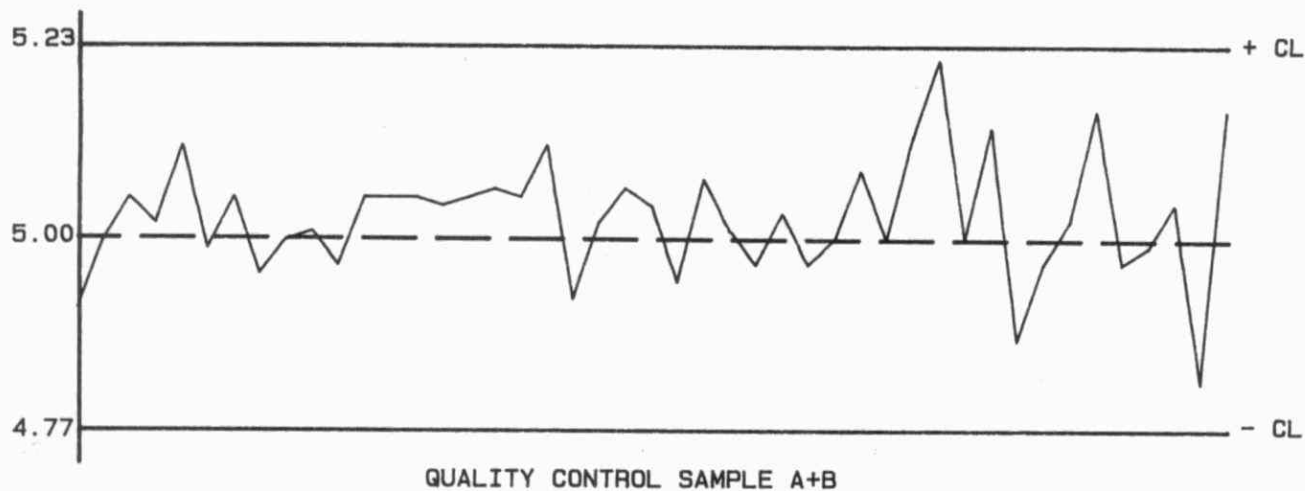
DETECTION CRITERION: N/A

OTHER CHECKS:

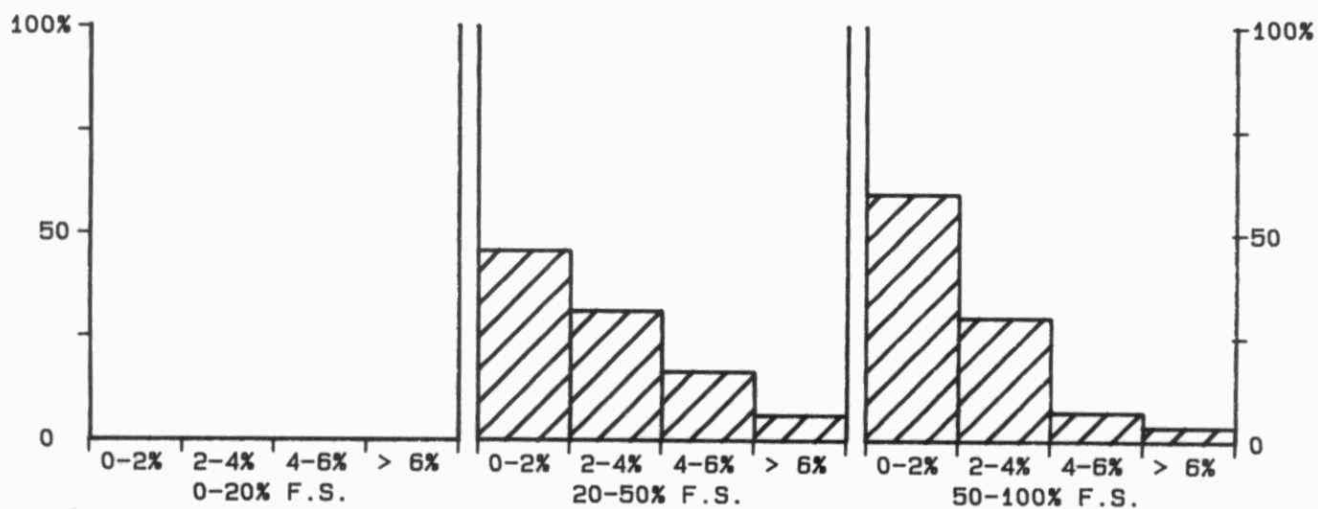
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	42	0.72	0.414
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS CALCIUM (MG/L AS CA)

FROM: 07/01/85
TO: 10/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 5 MG/L AS CA

*** CARBON - DISSOLVED INORGANIC ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 03/06/80
Supervisor : F. Tomassini Units : mg/L as C
Sample Type/Matrix: Streams, Lakes

SAMPLING:

Quantity Required: 50 mL
Container : Pyrex culture tubes plus screw caps with cone-shaped liners

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the 10 mg/L level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, 60 C heating bath(7.7 mL delay), dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.05

CALIBRATION:

BL plus 9 standards daily.

CONTROLS:

Calibration : LTBL plus 4 standards, eg, QCA
Drift : BL every 10 samples and BL plus 1 standard every 20 samples.

NOTES:

As concentrations of calibration control solutions slowly change with time at these low concentrations, calibration control ranges are based on measured averages rather than expected concentrations.

CARBON - DISSOLVED INORGANIC
QUALITY CONTROL DATA FROM 08/01/85 TO 20/12/85

Lab: Dorset

Analytical Range: 0.05 to 10.00 mg/L as C

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	152	6.4	6.6	0.2	0.16
b :	152	2.2	2.3	0.1	0.09
a+b :	152	8.6	8.8	0.2	0.22
a-b :	152	4.2	4.3	0.1	0.15
c :	151	1.39	1.47	0.08	0.042
d :	151	0.63	0.61	-0.02	0.039
c+d :	151	2.02	2.08	0.06	0.073
c-d :	151	0.76	0.86	0.10	0.035

s.d.(AB): Sw(within run): 0.11 S(between runs): 0.13 S/Sw: 1.22
 s.d.(CD): Sw(within run): 0.025 S(between runs): 0.041 S/Sw: 1.64

On any given day the calibration is accepted if the values obtained lie within the ranges:

8.0 to 9.2 for A+B
 3.8 to 4.6 for A-B
 1.72 to 2.32 for C+D
 0.56 to 0.96 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	92	0.00 - 0.50	0.017	4.9
	122	0.50 - 1.00	0.018	2.2
	153	1.00 - 2.00	0.033	2.3
	65	2.00 - 5.00	0.075	2.6
	17	5.00 - 10.00	0.177	2.6
	449	Overall	0.050	N/A

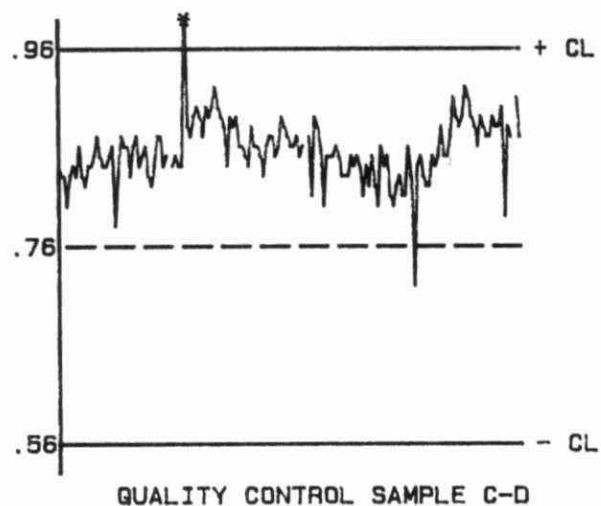
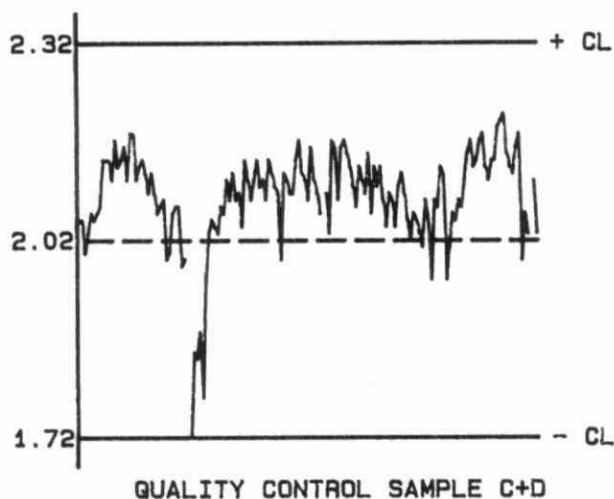
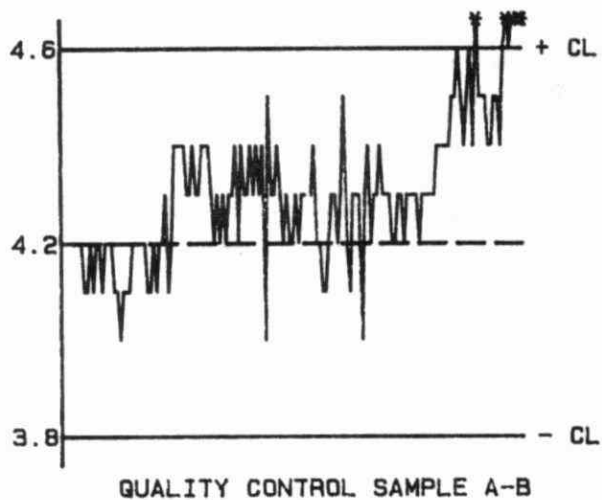
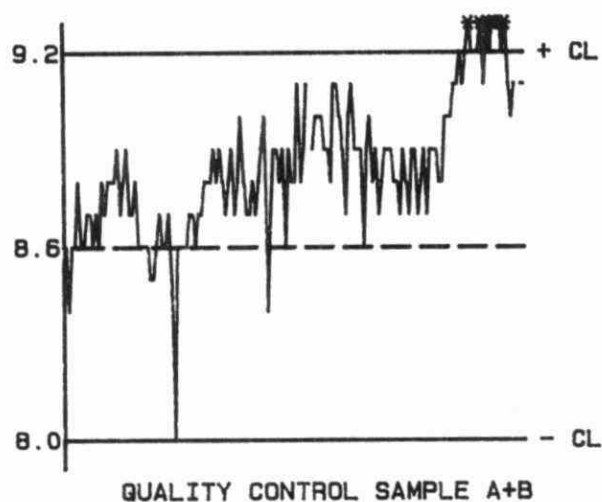
DETECTION CRITERION: 0.05

OTHER CHECKS:

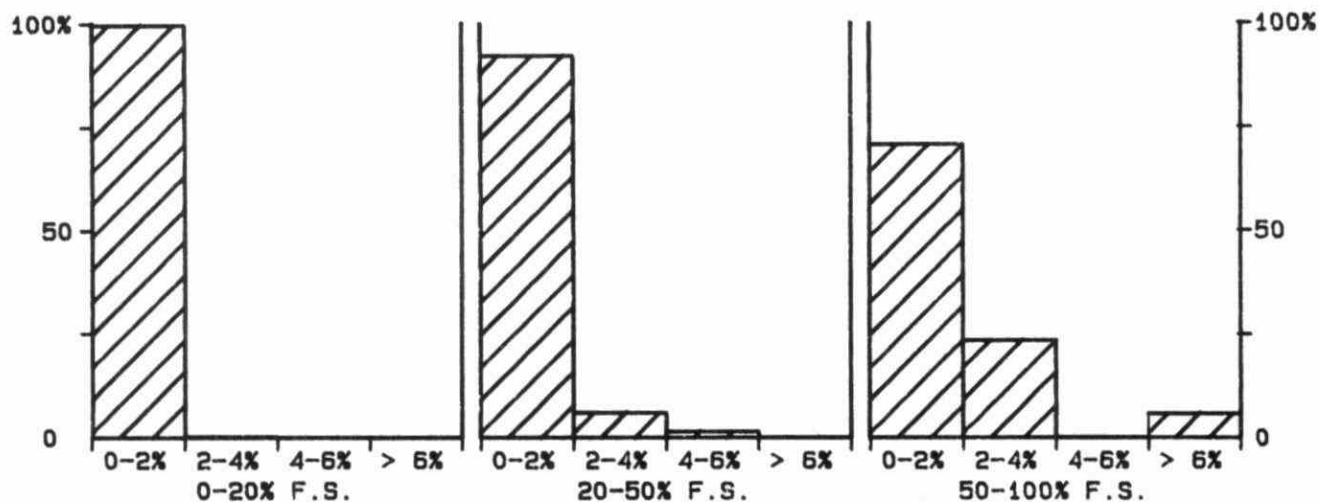
	Number of Data	Data Mean	Standard(1) Deviation
STD. CAL. :	148	565	48.3
Long Term Blank :	151	0.18	0.029

QUALITY CONTROL GRAPHS CARBON - DISSOLVED INORGANIC (MG/L AS C)

FROM: 08/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 10 MG/L AS C

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/78
LIS Test Name Code: DIC Units : mg/L as C
Work Station Code : ROC Unit Code : 064806
Method Code : 102AC2 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents,
Domestic Water Supplies, Leachates, Sewages, Industrial Wastes

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.4 at the 40 mg/L level.

N.B. Dissolved organic carbon is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.2

Detection Criterion (T): 0.5

CALIBRATION:

BL plus 1 standard daily. BL plus 4 standards whenever a new stock of buffer is prepared.

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA

Drift : BL plus 1 standard

CARBON - DISSOLVED INORGANIC
QUALITY CONTROL DATA FROM 04/01/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.46 to 40.00 mg/L as C

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	155	30.00	30.18	0.18	0.332
b :	155	10.00	10.09	0.09	0.287
a+b :	155	40.00	40.27	0.27	0.510
a-b :	155	20.00	20.09	0.09	0.354

s.d.(AB): Sw(within run): 0.250 S(between runs): 0.310 S/Sw: 1.24

On any given day the calibration is accepted if the values obtained lie within the ranges:

37.60 to 42.40 for A+B
 18.40 to 21.60 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	167	0.00 - 4.00	0.154	13.4
	38	4.00 - 10.00	0.473	6.9
	47	10.00 - 20.00	0.211	1.4
	66	20.00 - 40.00	0.565	2.1
	318	Overall	0.335	N/A

DETECTION CRITERION: 0.46

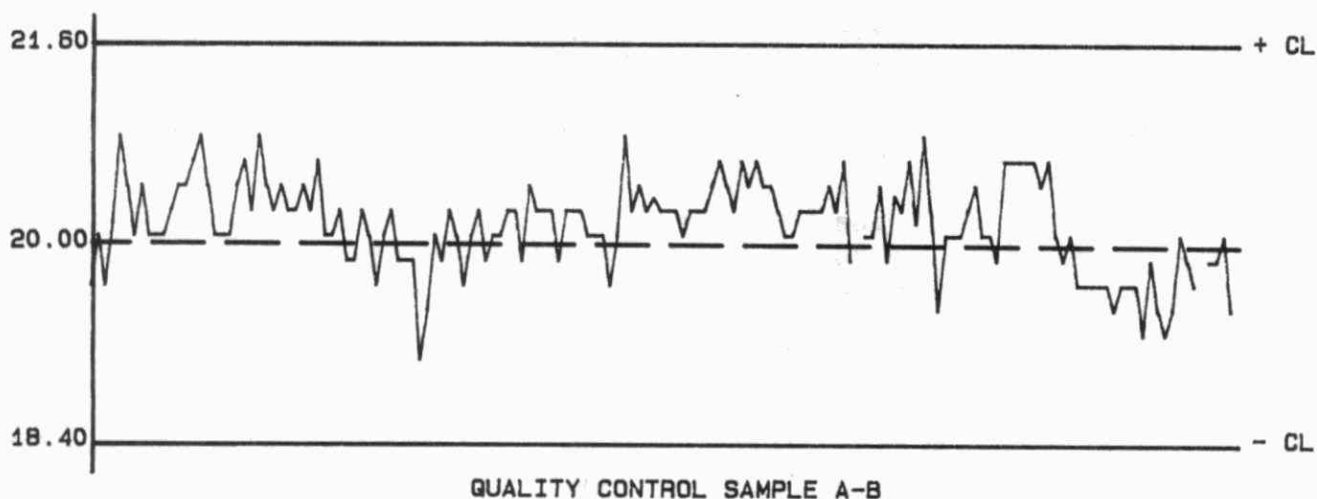
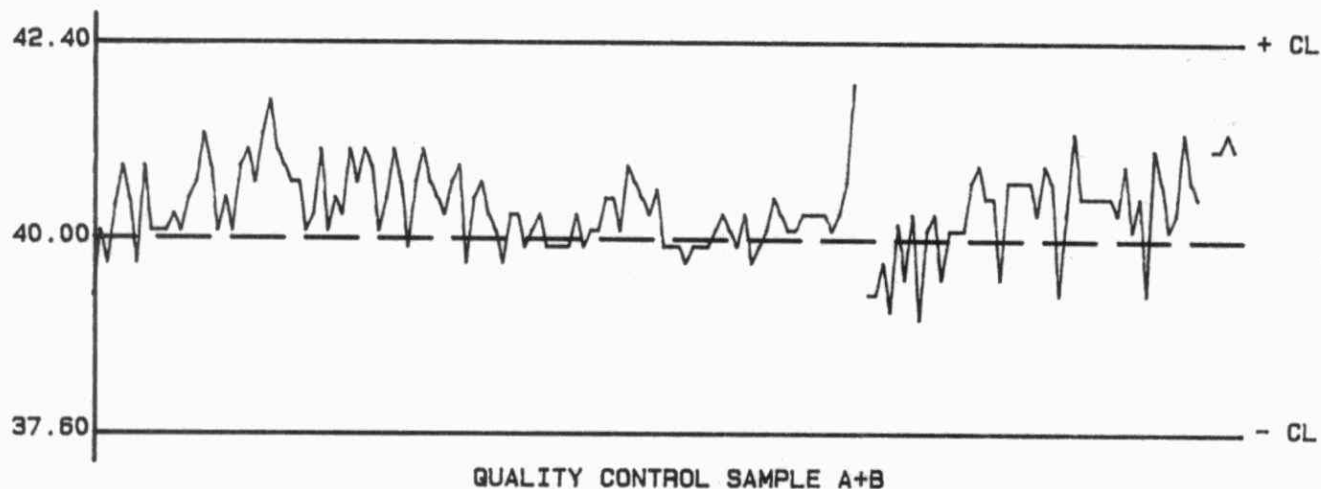
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Std Cal :	141	393	100.9
Long Term Blank :	152	0.1	0.11

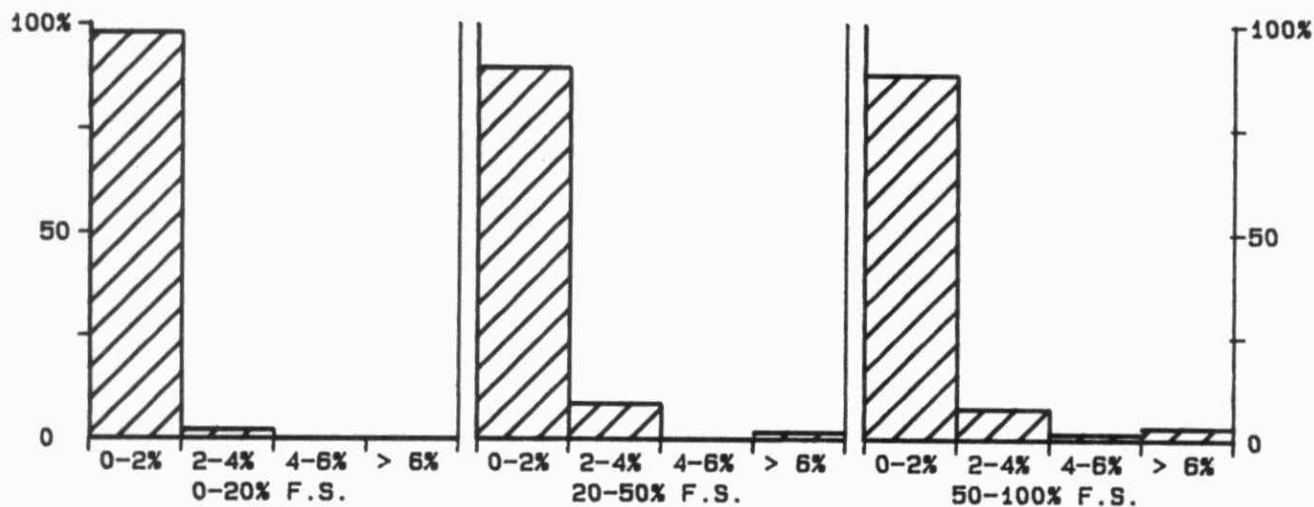
QUALITY CONTROL GRAPHS CARBON - DISSOLVED INORGANIC (MG/L AS C)

FROM: 04/01/85

TO: 13/02/88



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 40 MG/L AS C

*** CARBON - DISSOLVED ORGANIC ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/78
LIS Test Name Code:	DOC	Units	: mg/L as C
Work Station Code	: ROC	Unit Code	: 064806
Method Code	: 102AC2	Supervisor	: J. Crowther

Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Waters, Leachates, Sewages, Industrial Wastes

SAMPLING:

Quantity Required: 50 mL
 Container : Glass or plastic

ANALYTICAL PROCEDURE:

Using an automated system, the supernatant from a settled sample is acidified and flushed with nitrogen gas (500 mL/min) to remove inorganic carbon. Organic carbon is then oxidized to carbon dioxide gas by exposure to ultra-violet light (UV) in acid-persulphate media. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved organic carbon content of the sample.

Approximate absorbance: 0.3 at the 20 mg/L level.

N.B. Dissolved inorganic carbon is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: nitrogen and air (CO₂-free) gas supplies with flow controls, dialysis unit, UV digester. Colourimetric measurement is through a 5.0 cm. light path at 550 nm.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.1

Detection Criterion (T): 0.3

CALIBRATION:

BL plus 1 standard daily. BL plus 4 standards whenever a new stock of buffer is prepared.

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA

Drift : BL plus 1 standard

CARBON - DISSOLVED ORGANIC
QUALITY CONTROL DATA FROM 04/01/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.28 to 20.00 mg/L as C

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	157	15.00	15.14	0.14	0.167
b :	157	5.00	5.00	0.00	0.094
a+b :	157	20.00	20.15	0.15	0.205
a-b :	157	10.00	10.14	0.14	0.177

s.d.(AB): Sm(within run): 0.125 S(between runs): 0.136 S/Sm: 1.08

On any given day the calibration is accepted if the values obtained lie within the ranges:

18.80 to 21.20 for A+B
 9.20 to 10.80 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	118	0.00 - 2.00	0.095	8.8
	189	2.00 - 5.00	0.111	3.3
	76	5.00 - 10.00	0.131	1.9
	29	10.00 - 20.00	0.242	1.8
	412	Overall	0.124	N/A

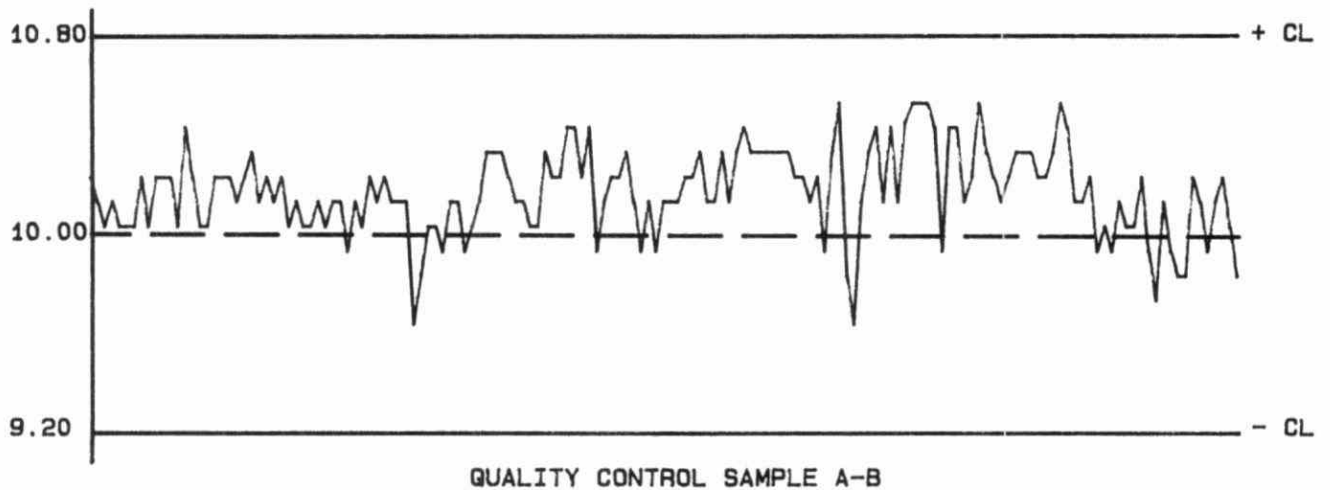
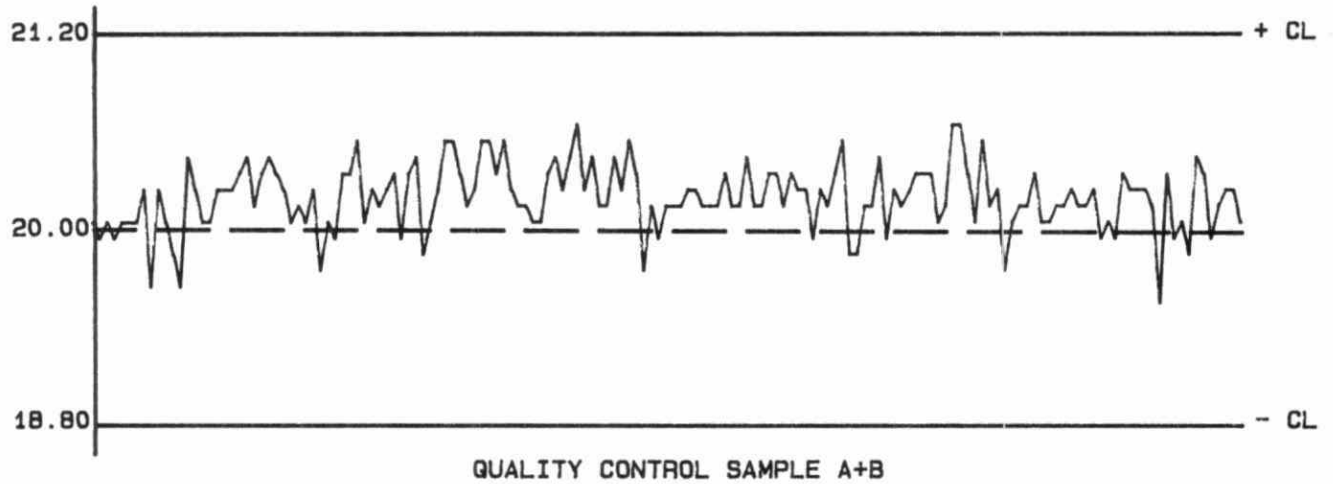
DETECTION CRITERION: 0.28

OTHER CHECKS:

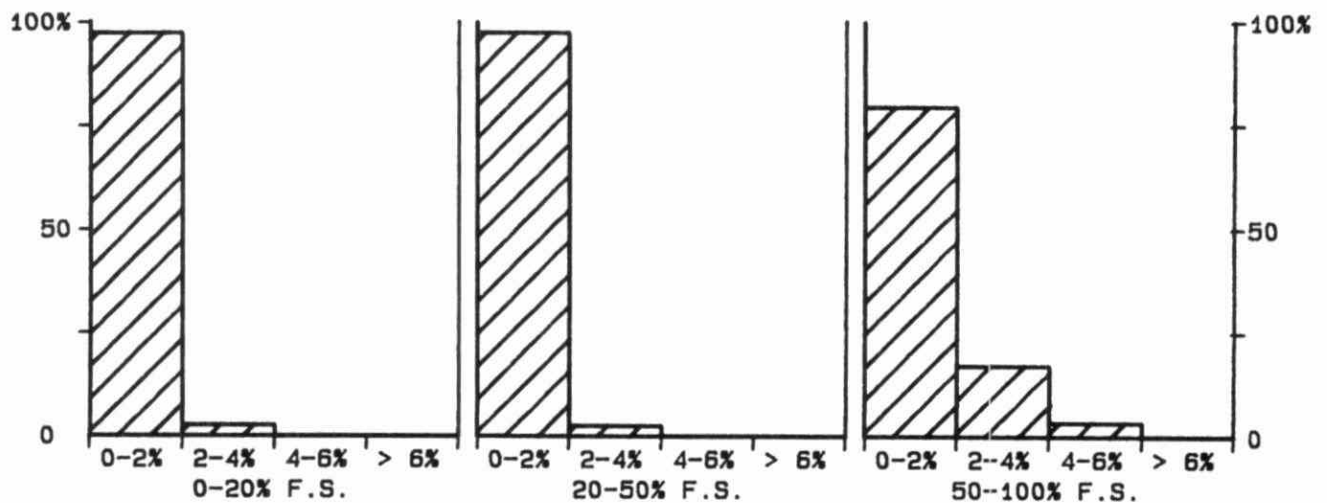
	Number of Data	Data Mean	Standard(1) Deviation
Std Cal :	144	477	121.1
Long Term Blank :	155	0.1	0.05

QUALITY CONTROL GRAPHS CARBON - DISSOLVED ORGANIC (MG/L AS C)

FROM: 04/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 MG/L AS C

44
*** CHLORIDE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/06/66
LIS Test Name Code:	CLIDUR	Units	: mg/L as Cl
Work Station Code	: WCL	Unit Code	: 064817
Method Code	: 002BT3	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Sewage, Industrial Waste, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

An aliquot (10.0 mL) of sample is automatically pipetted and titrated with silver nitrate to an endpoint which is determined by calibration. The addition of silver nitrate to a sample containing chloride ions results in the precipitation of silver chloride with a corresponding change in voltage between the electrodes. The endpoint is equivalent to the maximum change in voltage per unit volume of titrant. A reagent containing acetone and nitric acid is utilized to prevent fouling of the electrodes by silver chloride precipitate.

INSTRUMENTATION:

Radiometer ATS-1 autopipetting titration system equipped with a silver-silver chloride electrode and a non-calomel reference electrode.

REPORTING:

Maximum Significant Figures: 4	
Minimum Increment (W) : 0.2	Detection Criterion (T): 1.3

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : Acid wash, BL, plus 1 standard

CHLORIDE
QUALITY CONTROL DATA FROM 02/01/85 TO 27/12/85

Lab: Domestic Water

Analytical Range: 1.3 to 500.0 mg/L as Cl

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	112	170.0	169.6	-0.4	1.67
b :	112	17.0	17.1	0.1	0.52
a+b :	112	187.0	186.7	-0.3	1.73
a-b :	112	153.0	152.5	-0.5	1.78

s.d.(AB): Sw(within run): 1.26 S(between runs): 1.24 S/Sw: 0.98

On any given day the calibration is accepted if the values obtained lie within the ranges:

172.0 to 202.0 for A+B
 143.0 to 163.0 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	198	0.0 - 50.0	0.44	2.7
	45	50.0 - 100.0	0.88	1.2
	23	100.0 - 250.0	1.12	0.7
	8	250.0 - 500.0	2.57	0.8
	274	Overall	0.75	N/A

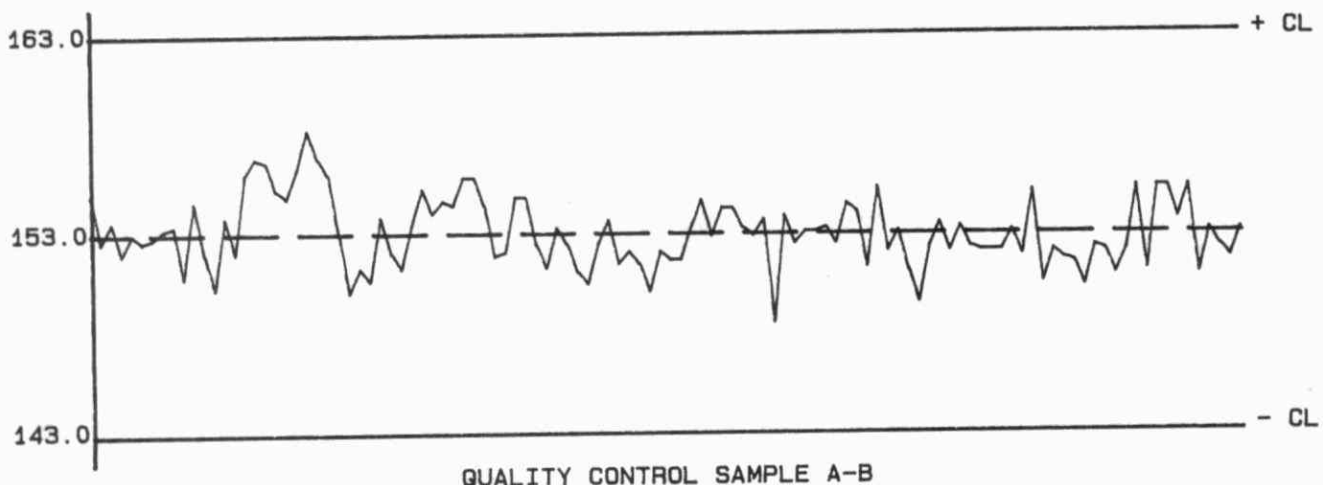
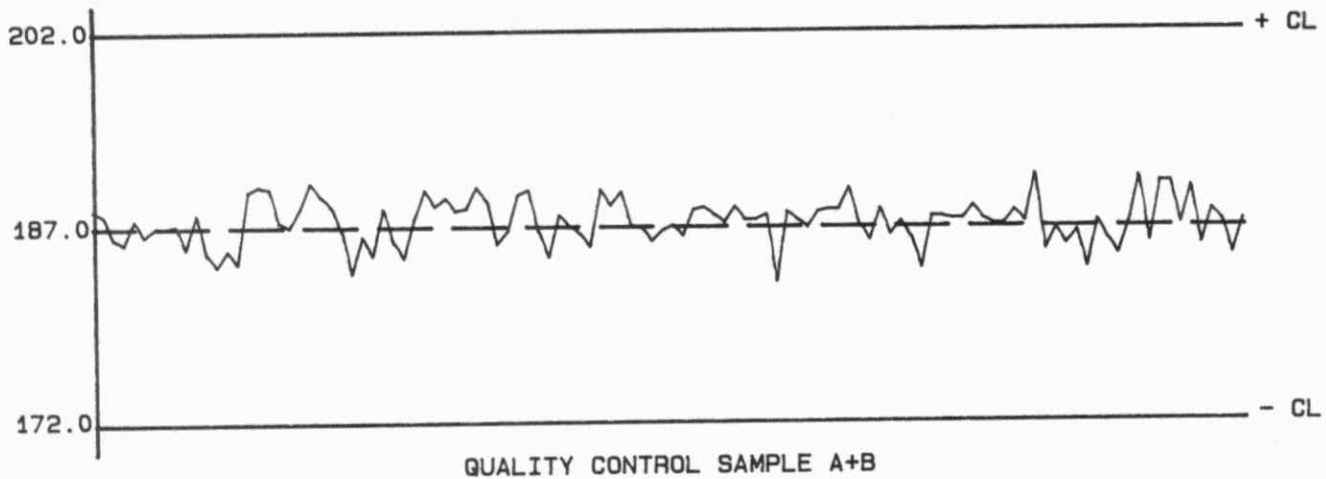
DETECTION CRITERION: 1.3

QUALITY CONTROL GRAPHS

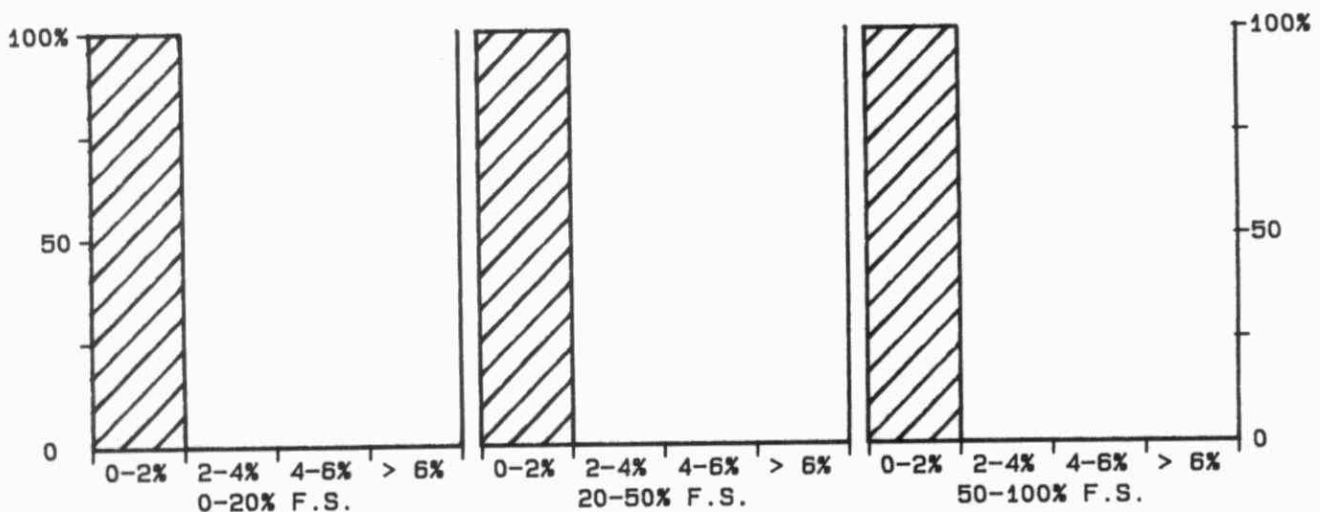
CHLORIDE (MG/L AS CL)

FROM: 02/01/85

TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 500 MG/L AS CL

*** CHLORIDE ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/04/78
LIS Test Name Code:	CLIDUR	Units	: mg/L as Cl
Work Station Code	: PRIC1	Unit Code	: 064817
Method Code	: 005A10	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow			

SAMPLING:

Quantity Required: 15 ml.
Container : Polystyrene bottle.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample scan to a series of standard scans.

Full scale conductivity : 10 uS/cm.

Nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus microcomputer for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.01

Detection Criterion (T): 0.05

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration : 2 standards (eg) QCA

Drift : 1 standard every 10 samples.

MODIFICATIONS:

20/09/84 - Chloride range was changed from 1.50 mg/L full scale to 2.00 mg/L full scale.

12/04/85 - Chloride quality control standards were changed; QCA from 1.20 to 1.60 mg/L, QCB from 0.30 to 0.40 mg/L. First three months' data were omitted because they were not comparable with the later ones.

CHLORIDE
QUALITY CONTROL DATA FROM 12/04/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.05 to 2.00 mg/L as Cl

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	110	1.60	1.59	-0.01	0.012
b :	111	0.40	0.40	-0.00	0.016
a+b :	110	2.00	1.99	-0.01	0.020
a-b :	110	1.20	1.20	-0.00	0.019

s.d.(AB): Sw(within run): 0.013 S(between runs): 0.014 S/Sw: 1.05

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.85 to 2.15 for A+B

1.10 to 1.30 for A-B

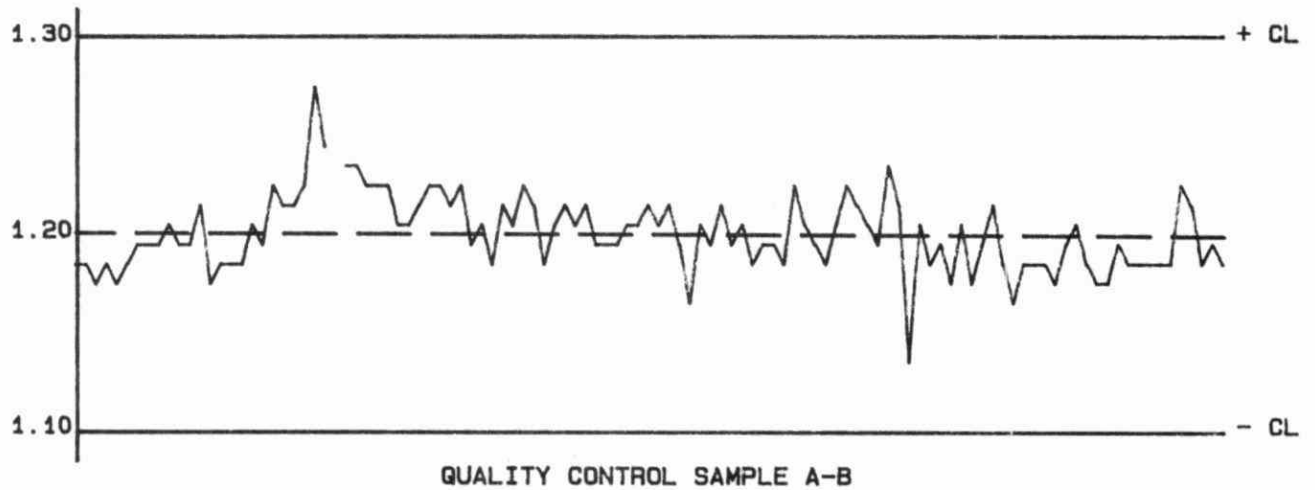
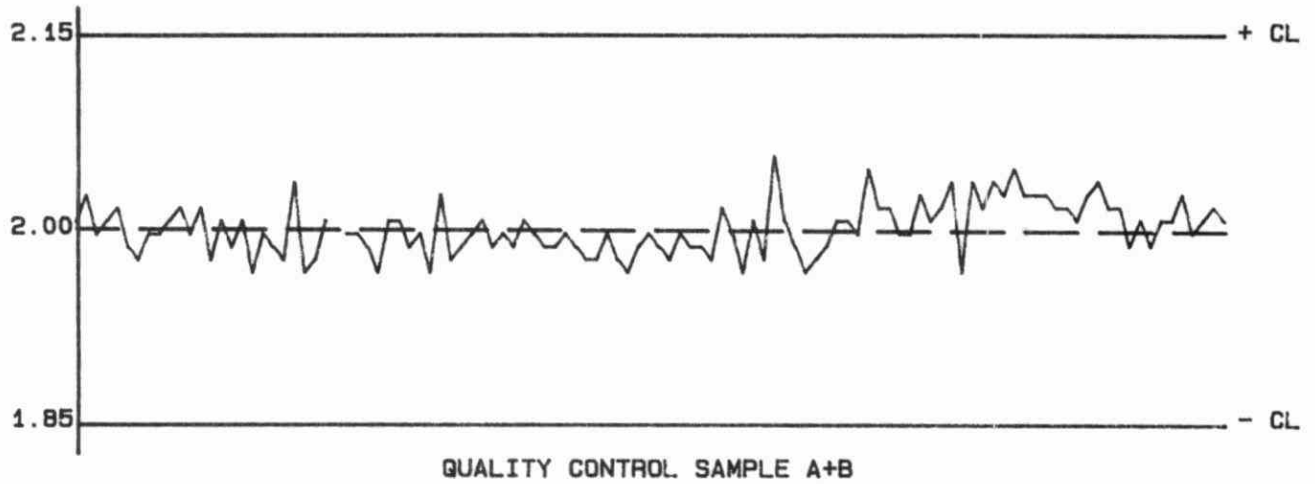
DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
57	0.00 - 0.20	0.018	16.5
56	0.20 - 0.50	0.028	8.9
15	0.50 - 1.00	0.027	4.1
2	1.00 - 2.00	0.010	0.6
130	Overall	0.024	N/A

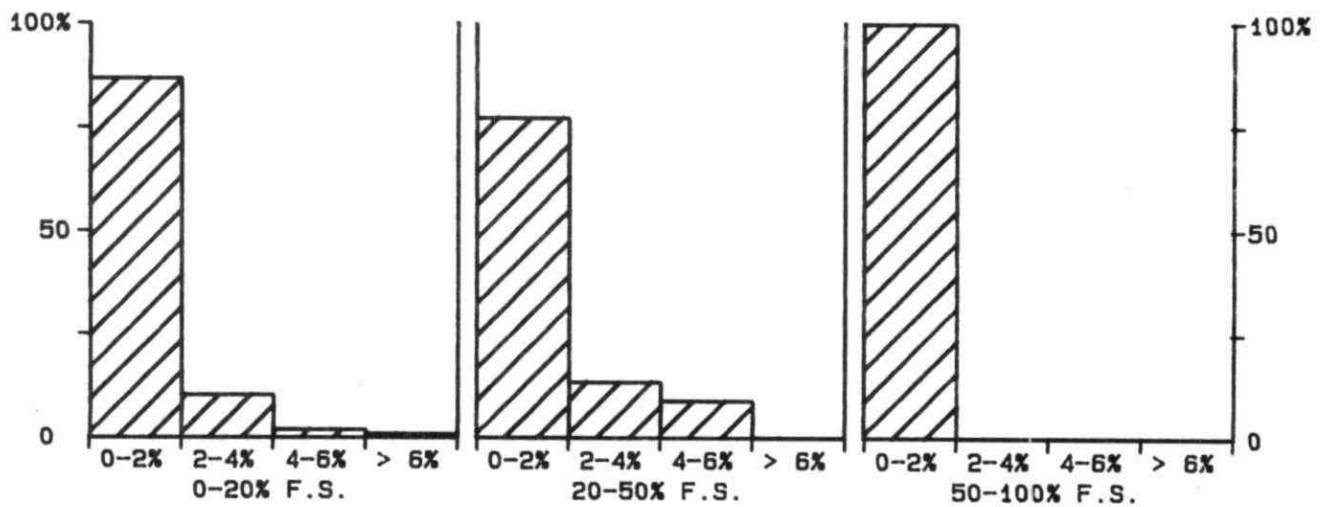
DETECTION CRITERION: 0.05

QUALITY CONTROL GRAPHS CHLORIDE (MG/L AS CL)

FROM: 12/04/85
TO: 23/12/85



--- EXPECTED VALUE
--- CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS CL

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/04/78
LIS Test Name Code:	CLIDUR	Units	: ug/Filter as Cl
Work Station Code	: PRLOV	Unit Code	: 361817
Method Code	: 004AIC	Supervisor	: M. Rawlings
Sample Type/Matrix: W40 filters from LoVol filter packs.			

SAMPLING:

Quantity Required: 1 filter
Container : Polyethylene bag

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW in polyethylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by comparison of the sample scan to a series of standard scans. Results are converted to ug/filter as Cl.

Full scale conductivity : 30 uS/cm.

Nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Ultrasonic bath; polyethylene tubes
Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment(W): 0.50 ug/filter Detection Criterion(T): 0.8 ug/filter

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples

MODIFICATIONS:

10/03/84 - Microcomputer for automated sampling and timing was introduced. At that time automated spiking of samples with Na₂CO₃/NaHCO₃ was introduced.

20/09/84 - Chloride range was changed from 1.50 mg/L full scale to 2.00 mg/L full scale. Quality control standards were not changed.

12/04/85 - Chloride quality control standards were changed; QCA from 1.20 to 1.60 mg/L and QCB from 0.30 to 0.40 mg/L. First three months' data were omitted because they were not comparable with the later ones.

10/05/85 - Microcomputer used for data reduction. Three additional calibration standards were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received.

CHLORIDE
QUALITY CONTROL DATA FROM 30/04/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.8 to 100.0 ug/filter as Cl

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	25	80.0	79.4	-0.6	1.03
b :	25	20.0	20.4	0.4	0.56
a+b :	25	100.0	99.8	-0.2	1.27
a-b :	25	60.0	59.0	-1.0	1.08

s.d.(AB): Sw(within run): 0.76 S(between runs): 0.83 S/Sw: 1.09

On any given day the calibration is accepted if the values obtained lie within the ranges:

92.5 to 107.5 for A+B
 55.0 to 65.0 for A-B

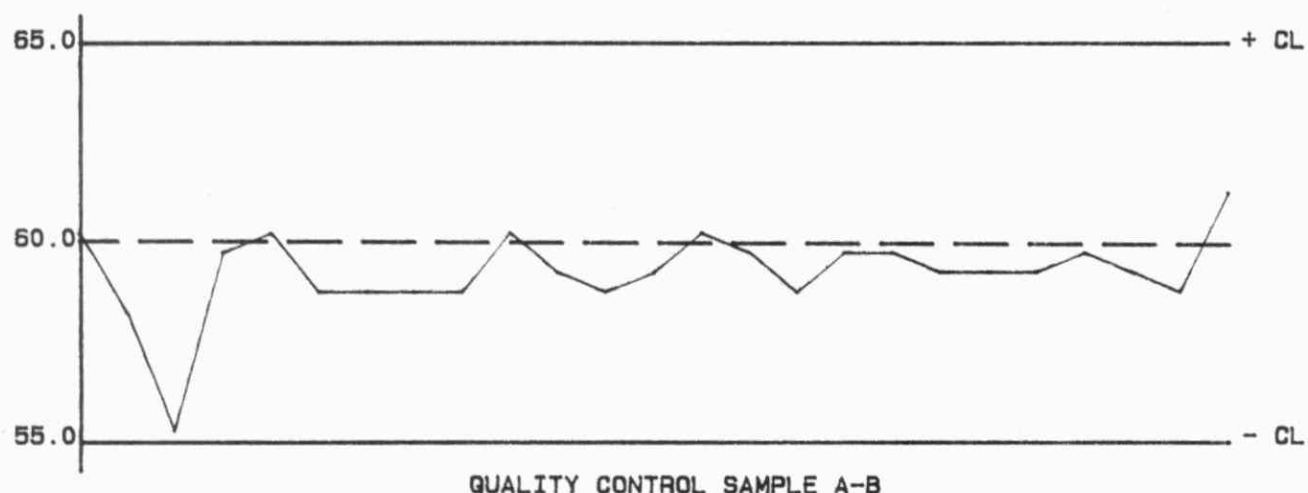
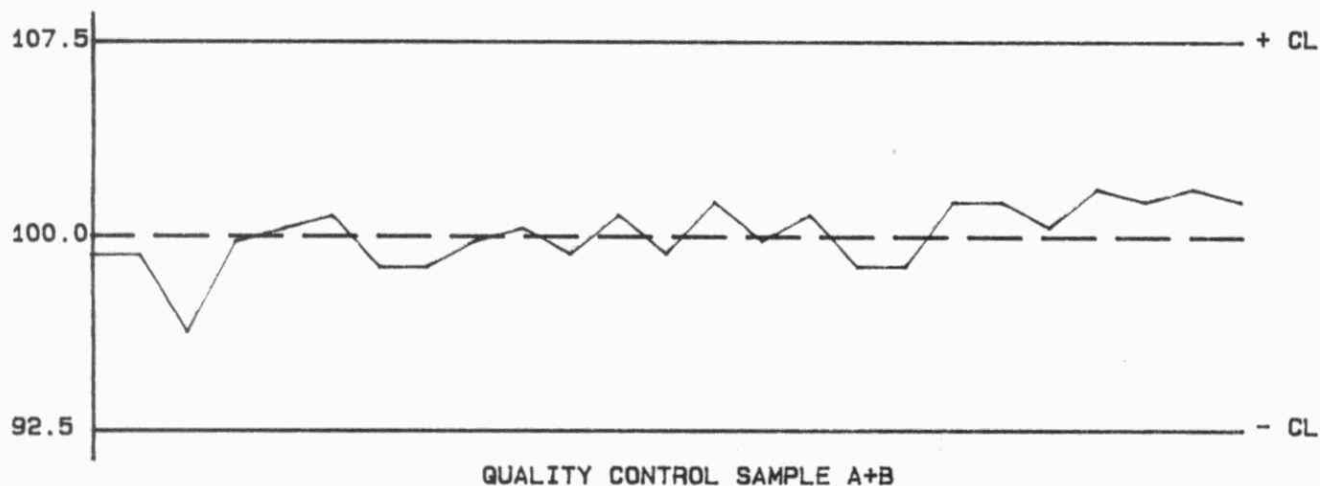
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	8	0.0 - 15.0	0.28	9.2
	10	15.0 - 37.5	0.62	2.7
	9	37.5 - 100.0	1.29	2.7
	27	Overall	0.85	N/A

DETECTION CRITERION: 0.8

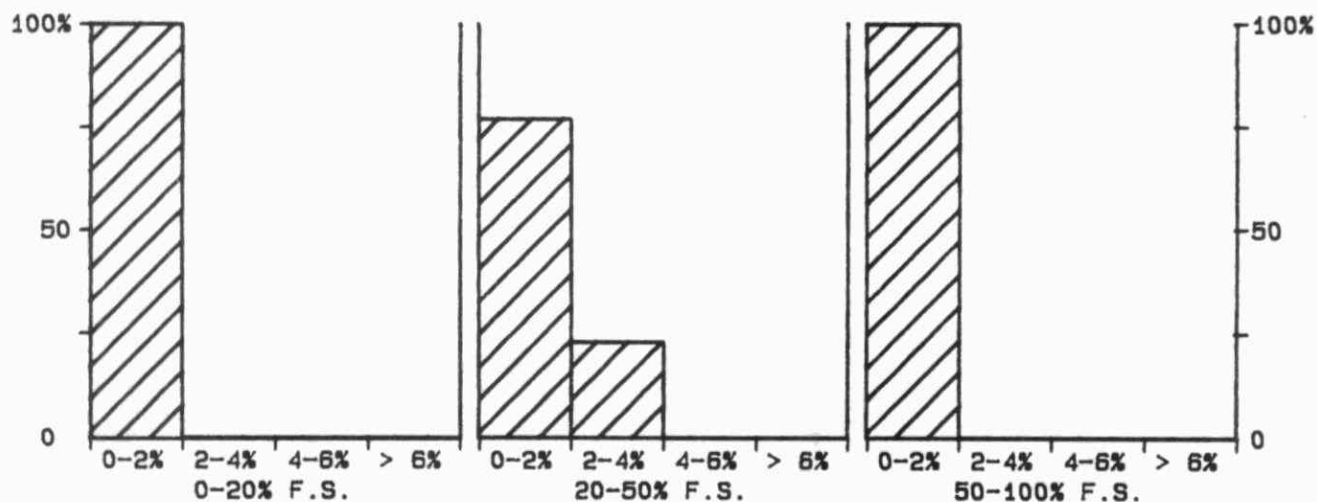
QUALITY CONTROL GRAPHS CHLORIDE (UG/FILTER AS CL)

FROM: 30/04/85

TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 UG/FILTER AS CL

*** CHLORIDE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/05/75
LIS Test Name Code:	CLIDUR	Units	: mg/L as Cl
Work Station Code	: RMSICL	Unit Code	: 064817
Method Code	: 004AC2	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts. Effluents.		

SAMPLING:

Quantity Required: 50 ml
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Chloride ions are combined with mercuric thiocyanate releasing thiocyanate quantitatively. Thiocyanate then reacts with ferric ions to produce ferric thiocyanate (red), and the absorbance of the latter is measured colourimetrically. A reference stream, from which mercuric thiocyanate has been eliminated, is utilized to compensate for sample matrix effects.
Approximate absorbance: 0.3 at the 50 mg/L level
N.B. Reactive silicates are determined simultaneously.

INSTRUMENTATION:

Boxed-FIA system consisting of basic automated modular continuous flow system plus the following modules: sample injection valves with air-flow controls, timer, bubble-gate. Colourimetric measurement is through a 1.5 cm light path at 470nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.05 Detection Criterion (T): 0.24

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : BL plus 4 standard

MODIFICATIONS:

04/07/83 - Modules required for Boxed-FIA system were introduced. The number of calibration standards was increased from 2 to 10, and concentrations of QC standards were adjusted. The analytical rate was tripled.

CHLORIDE
QUALITY CONTROL DATA FROM 03/01/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.24 to 50.0 mg/L as Cl

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	66	30.0	30.0	0.0	0.41
b :	66	8.0	8.1	0.1	0.17
a+b :	66	38.0	38.1	0.1	0.50
a-b :	66	22.0	21.9	-0.1	0.38
c :	66	8.00	8.05	0.05	0.115
d :	66	2.00	2.04	0.04	0.060
c+d :	66	10.00	10.09	0.09	0.133
c-d :	66	6.00	6.00	0.00	0.126

s.d.(AB): Sw(within run): 0.27 S(between runs): 0.31 S/Sw: 1.17
s.d.(CD): Sw(within run): 0.089 S(between runs): 0.092 S/Sw: 1.03

On any given day the calibration is accepted if the values obtained lie within the ranges:

35.8 to 40.2 for A+B
20.5 to 23.5 for A-B
9.55 to 10.45 for C+D
5.70 to 6.30 for C-D

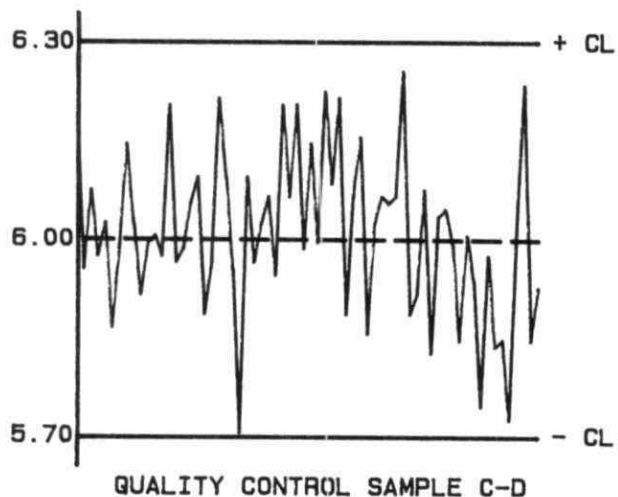
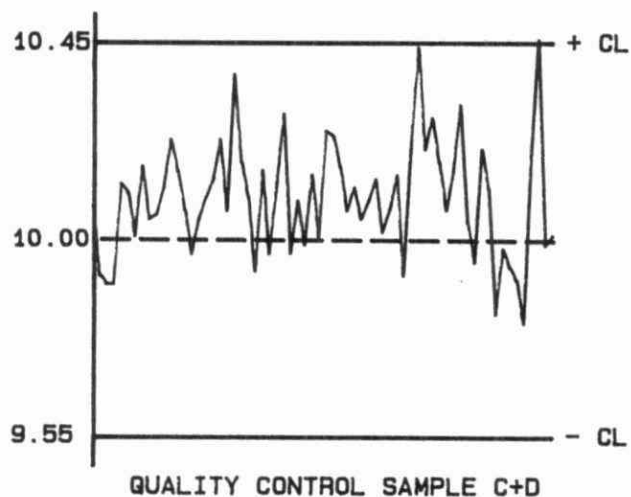
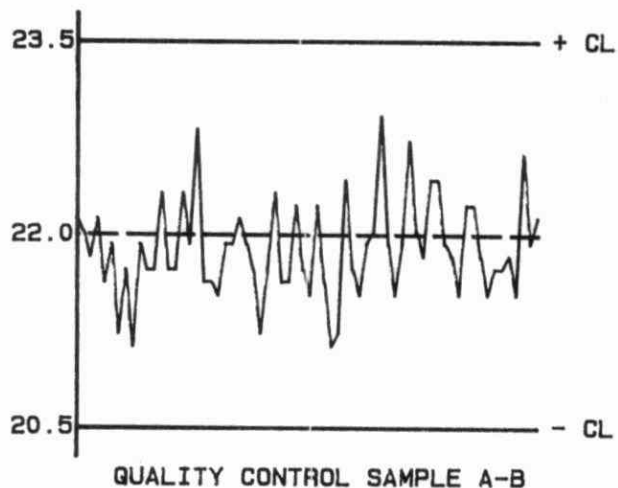
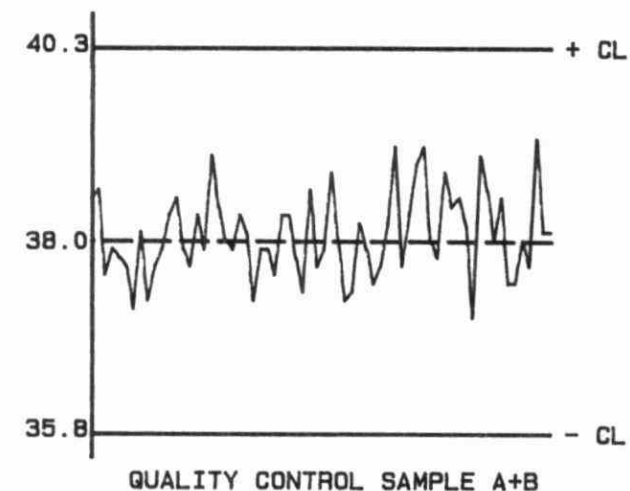
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	116	0.00 - 2.00	0.081	14.3
	16	2.00 - 5.00	0.233	6.9
	22	5.00 - 10.00	0.162	2.2
	61	10.0 - 25.0	0.35	1.8
	24	25.0 - 50.0	0.46	1.4
	239	Overall	0.25	N/A

DETECTION CRITERION: 0.24**OTHER CHECKS:**

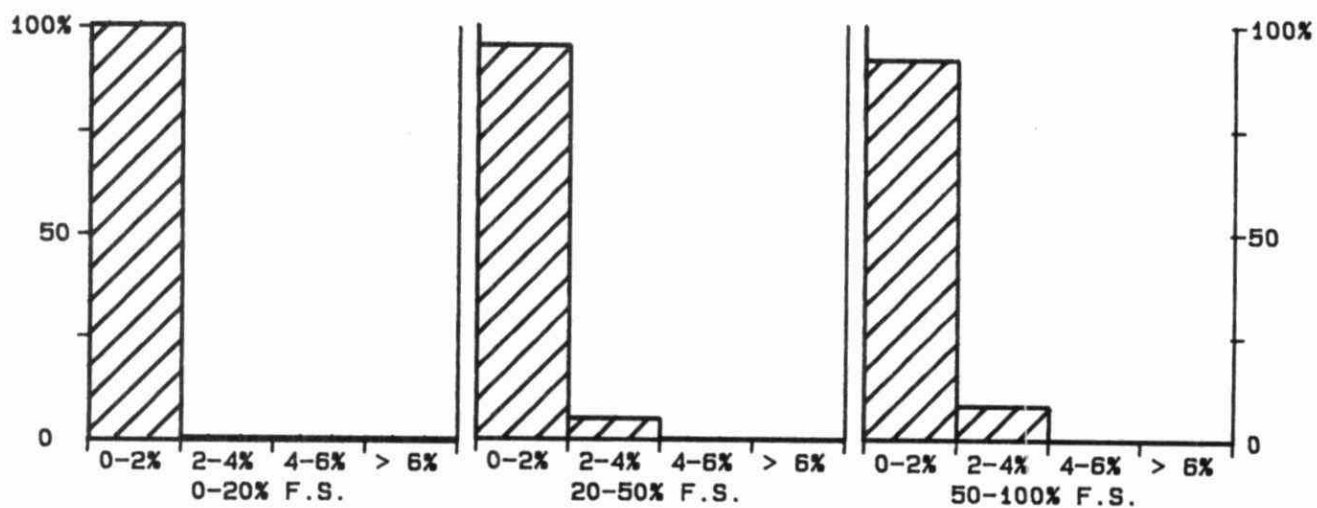
	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal. :	66	543	23.3
Long Term Blank :	66	0.00	0.002

QUALITY CONTROL GRAPHS CHLORIDE (MG/L AS CL)

FROM: 03/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 MG/L AS CL

*** CHLOROPHYLL ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/75
LIS Test Name Code: CHLRAT,CHLRBT,CHLRAC Units : ug/L
Work Station Code : RCHLO Unit Code : 063000
Method Code : 002DS1 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Effluents

SAMPLING:

Quantity Required: 1000 mL
Container : Glass
Other : In the field a sample is filtered through a 1.2 u cellulose nitrate membrane filter. The filter is then placed between two membrane filter-support pads, and the package is enclosed in a plastic dish.

SAMPLE PREPARATION:

If the sample has not been filtered in the field, a measured volume is filtered through a 1.2 um cellulose nitrate membrane filter under moderate suction. After the addition of 4.5 mL acetone (90% V/V), the filter is ground to release chlorophyll using glass beads; an additional 4.5 mL acetone (90% V/V) is added, and the mixture is rested overnight to improve extraction efficiency. After filtration through Whatman 934AH glass fibre filters (no suction), the volume is adjusted to 12.0 mL followed by centrifugation.

ANALYTICAL PROCEDURE:

Using a microcomputer-controlled, automated spectrophotometer, two scans are developed with absorbance measurements at 630, 645, and 665 nm; the minimum absorbance value between 710 and 750 nm (readings at 5 nm intervals) is utilized as a turbidity correction. Chlorophyll a and b are calculated from the first scan. After automated acidification, the second scan is obtained for the same wavelengths, and used for calculating chlorophyll a, corrected. SCOR-UNESCO equations are used for all chlorophyll calculations.

INSTRUMENTATION:

-Vacuum filtration modules; centrifuge set at 2500 rpm.
Automated modular continuous flow scanning spectrophotometer system.
-Microcomputer system for control of sampling, timing, and data processing (i.e. data capture, calculations, and transfer of results to LIS).

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.51,0.31,0.43

CONTROLS:

Calibration : LTBL plus 2 "standards", eg, QCA
Drift : 1 "standard"

MODIFICATIONS:

01/07/84 -Automated, microcomputer controlled system was introduced.
13/06/85 -Centrifuging steps were eliminated and nylon filters were introduced.

NOTES:

In 1982, calibration controls were stable, but were prepared from dyes rather than chlorophyll. "Standards" are now prepared from chlorophyll a and b, but the materials are neither analytical grade nor are their solutions stable. Thus calibration controls are based on measured averages.
No data summary is available for period not covered in performance report.

CHLOROPHYLL - a
QUALITY CONTROL DATA FROM 13/06/85 TO 17/12/85

Lab: Rivers and Lakes

Analytical Range: 0.51 to 10.00 ug/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	83	3.06	2.96	-0.10	0.094
b :	83	1.02	1.00	-0.02	0.056
a+b :	83	4.08	3.96	-0.12	0.139
a-b :	83	2.04	1.95	-0.09	0.068

s.d.(AB): Sw(within run): 0.048 S(between runs): 0.077 S/Sw: 1.61

On any given day the calibration is accepted if the values obtained lie within the ranges:

2.58 to 5.58 for A+B
 1.04 to 3.04 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	37	0.00 - 2.00	0.171	13.3
	24	2.00 - 5.00	0.298	9.7
	10	5.00 - 10.00	1.067	14.5
	71	Overall	0.453	N/A

DETECTION CRITERION: 0.51**OTHER CHECKS:**

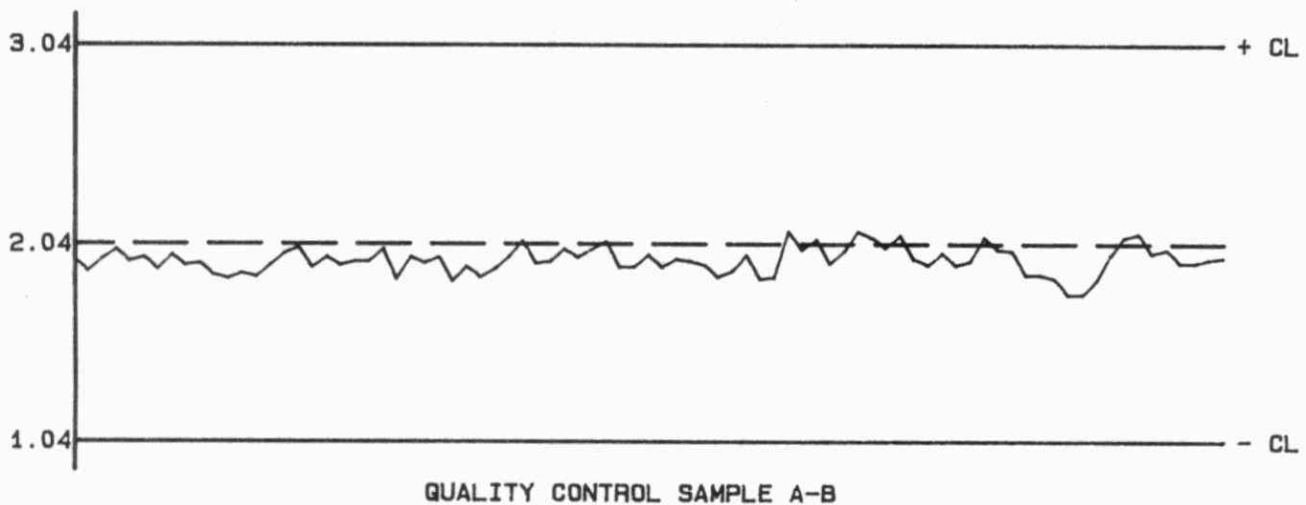
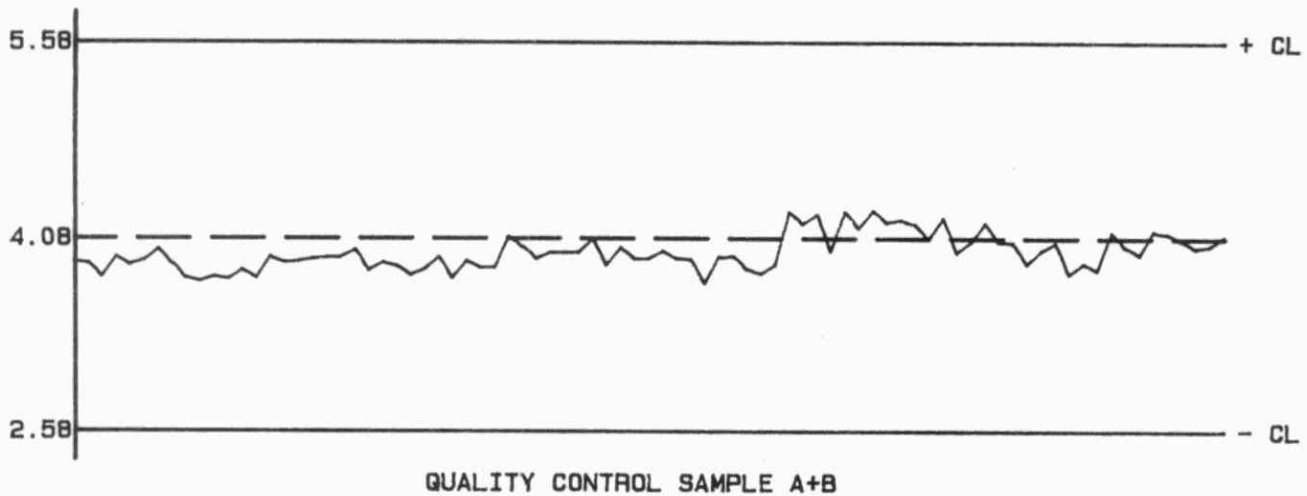
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	83	0.05	0.032
Digested Blank :	83	0.06	0.036

QUALITY CONTROL GRAPHS

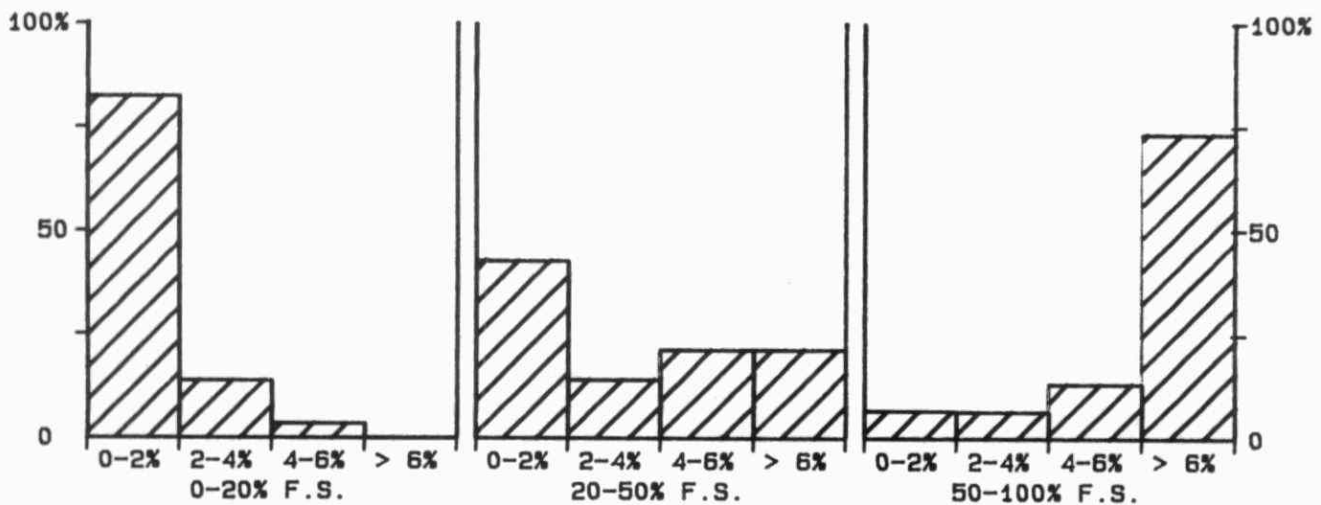
CHLOROPHYLL - A (UG/L)

FROM: 13/06/85

TO: 17/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 UG/L

CHLOROPHYLL - b
QUALITY CONTROL DATA FROM 13/06/85 TO 18/12/85

Lab: Rivers and Lakes

Analytical Range: 0.31 to 10.00 ug/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	85	3.06	2.99	-0.07	0.137
b :	85	1.02	1.03	0.01	0.075
a+b :	85	4.08	4.02	-0.06	0.200
a-b :	85	2.04	1.96	-0.08	0.094

s.d.(AB): Sw(within run): 0.066 S(between runs): 0.110 S/Sw: 1.66

On any given day the calibration is accepted if the values obtained lie within the ranges:

3.33 to 4.83 for A+B
 1.54 to 2.54 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	74	0.00 - 2.00	0.102	15.9
	5	2.00 - 5.00	0.462	13.9
	2	5.00 - 10.00	0.328	3.7
	81	Overall	0.159	N/A

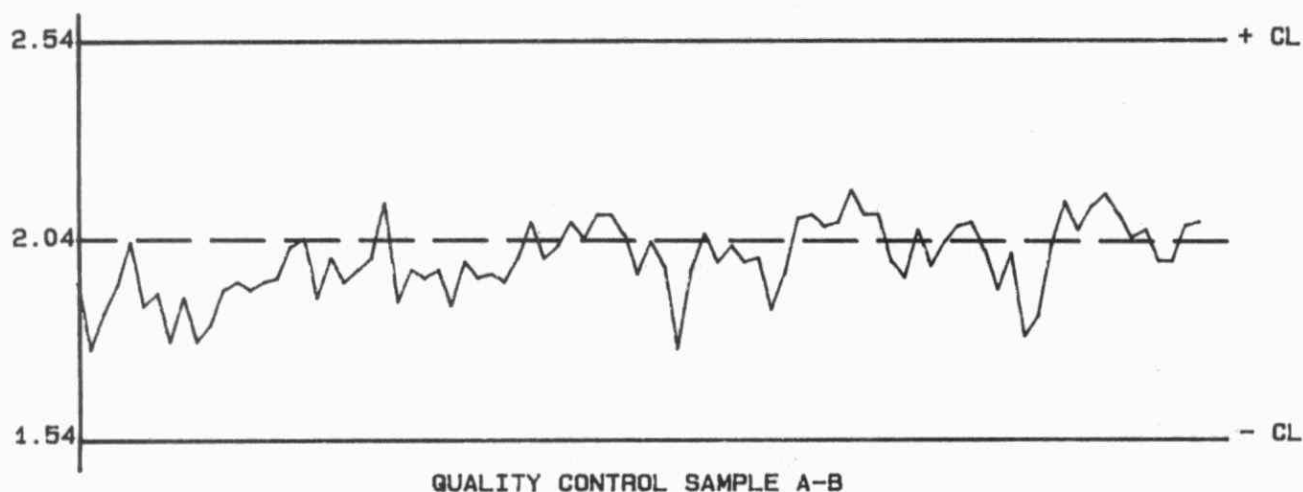
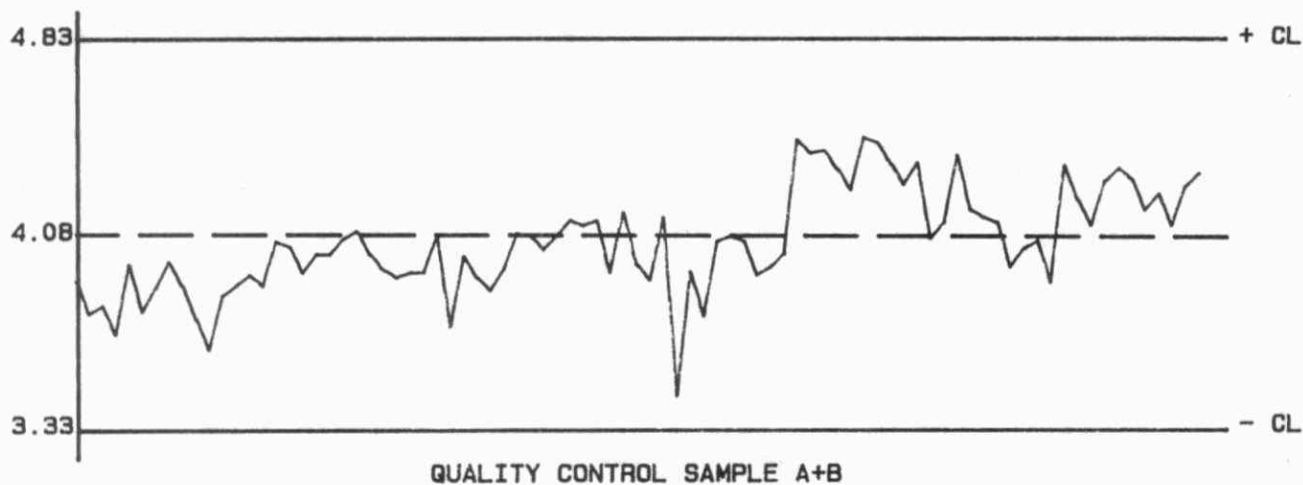
DETECTION CRITERION: 0.31

OTHER CHECKS:

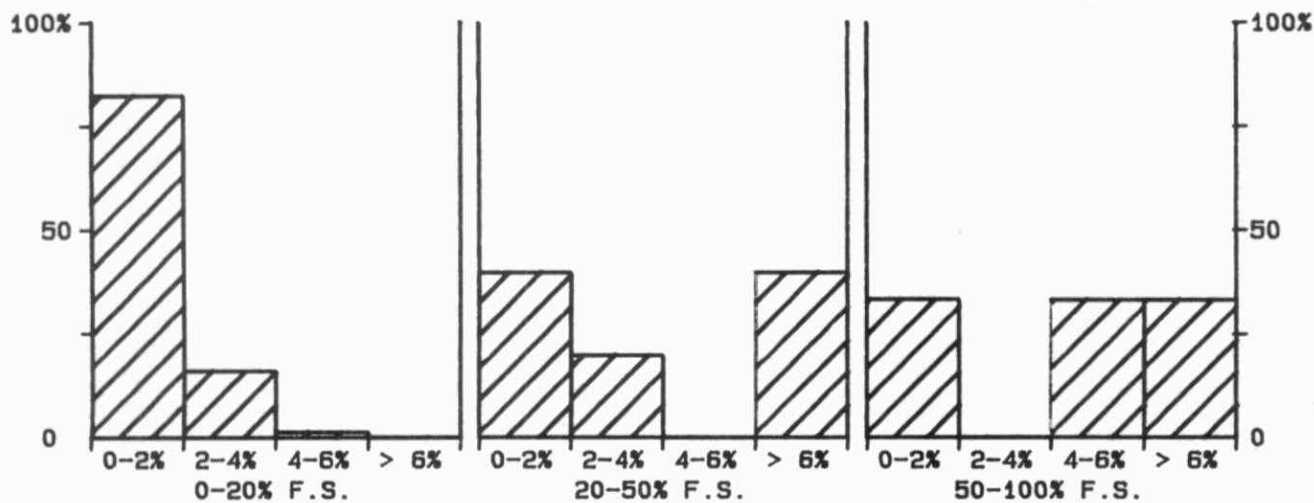
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	84	0.06	0.046
Digested Blank :	84	0.07	0.055

QUALITY CONTROL GRAPHS CHLOROPHYLL - B (UG/L)

FROM: 13/06/85
TO: 18/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 10 UG/L

CHLOROPHYLL-ACIDIFIED
QUALITY CONTROL DATA FROM 14/06/85 TO 17/12/85

Lab: Rivers and Lakes

Analytical Range: 0.43 to 10.00 ug/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	65	2.50	2.50	0.00	0.212
b :	65	1.00	0.80	-0.20	0.129
a+b :	65	3.50	3.30	-0.20	0.304
a-b :	65	1.50	1.70	0.20	0.176

s.d.(AB): Sw(within run): 0.124 S(between runs): 0.175 S/Sw: 1.41

On any given day the calibration is accepted if the values obtained lie within the ranges:

2.00 to 5.00 for A+B
 0.50 to 2.50 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	9	0.00 - 3.00	0.144	15.3
	2	3.00 - 5.00	0.235	5.8
	2	5.00 - 10.00	0.855	13.6
	13	Overall	0.368	N/A

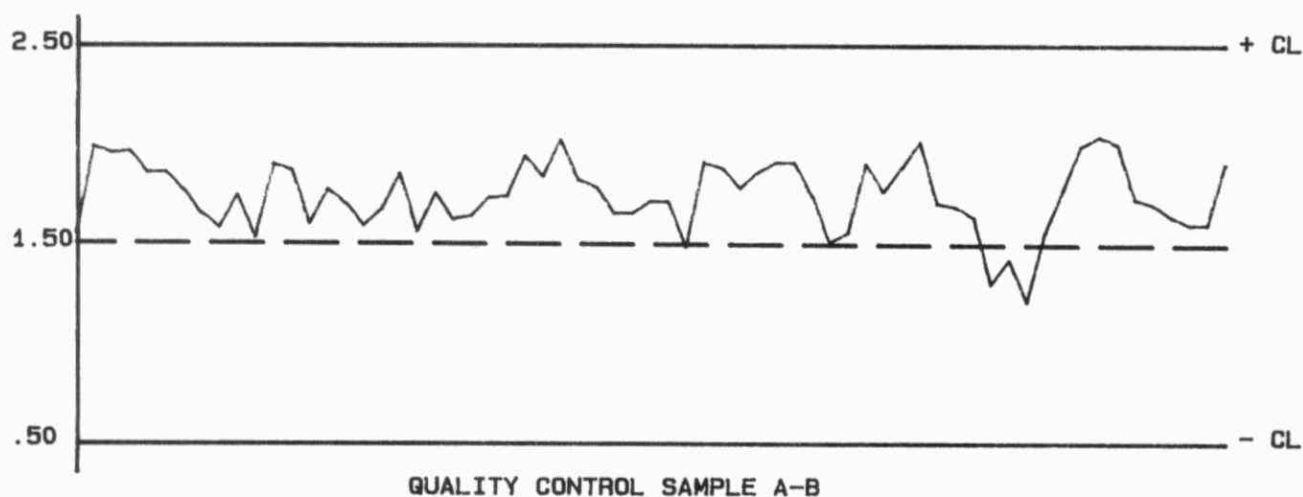
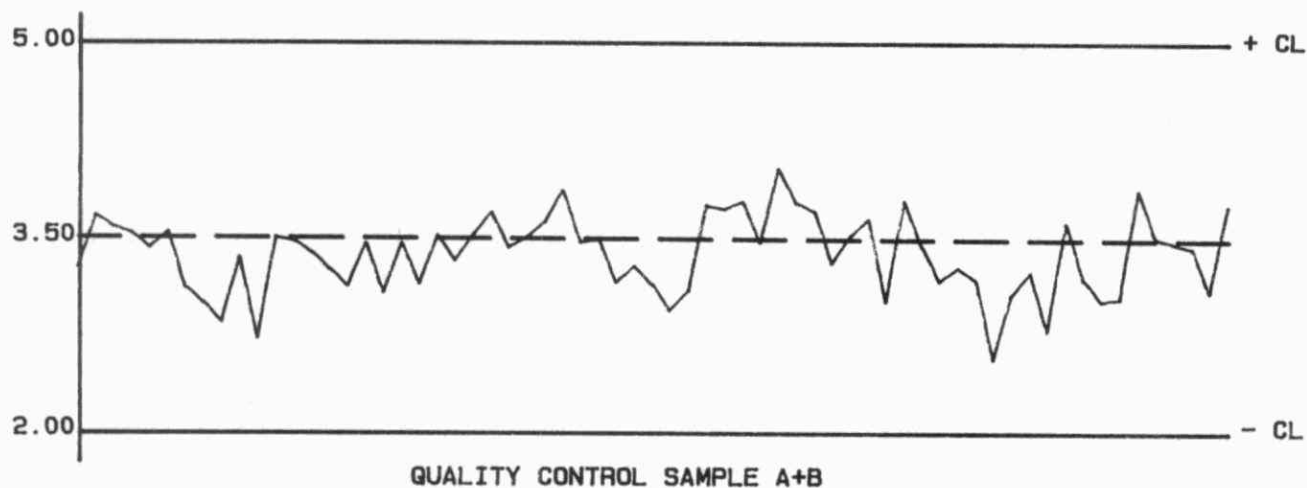
DETECTION CRITERION: 0.43**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	65	0.04	0.086
Digested Blank :	65	0.03	0.094

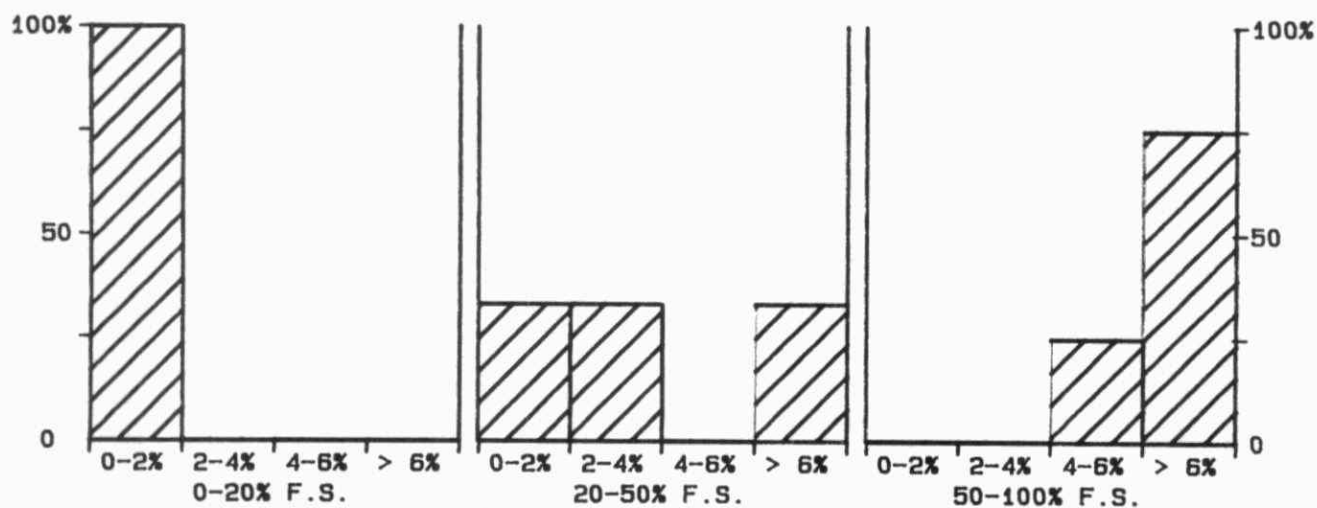
QUALITY CONTROL GRAPHS CHLOROPHYLL-ACIDIFIED (UG/L)

FROM: 14/06/85

TO: 17/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 UG/L

*** COLOUR - TRUE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	13/03/84
LIS Test Name Code:	COLTR	Units	: TCU
Work Station Code	: WCOL	Unit Code	: 342000
Method Code	: 102BC9	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

Approximate absorbance: 0.05 at the 70 TCU level.

INSTRUMENTATION:

Basic automated modular continuous flow system. Colour measurement is through a 3.0 cm. light path using a broadband filter(400-450nm). Turbidity measurement is through a 5.0 cm. light path using a different broadband filter(660-740nm).

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.5	Detection Criterion (T): 1.1

CALIBRATION:

BL plus 1 standard in duplicate

CONTROLS:

Calibration	: LTBL plus 2 standards, eg, QCA
Drift	: BL plus 1 standard

NOTES:

New procedure was initiated to conform with change in "Ontario Drinking Water Objectives"; copy of research study is available on request.

COLOUR-TRUE
QUALITY CONTROL DATA FROM 03/01/85 TO 31/12/85

Lab: Domestic Water

Analytical Range: 1.1 to 100.0 TCU

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	64	50.0	50.4	0.4	1.41
b :	64	25.0	24.9	-0.1	0.77
a+b :	64	75.0	75.3	0.3	2.07
a-b :	64	25.0	25.6	0.6	0.95
c :	64	25.0	24.9	-0.1	0.78
d :	64	5.0	4.5	-0.5	0.35
c+d :	64	30.0	29.3	-0.7	0.92
c-d :	64	20.0	20.4	0.4	0.78

s.d.(AB): Sw(within run): 0.67 S(between runs): 1.14 S/Sw: 1.69
s.d.(CD): Sw(within run): 0.55 S(between runs): 0.60 S/Sw: 1.10

On any given day the calibration is accepted if the values obtained lie within the ranges:

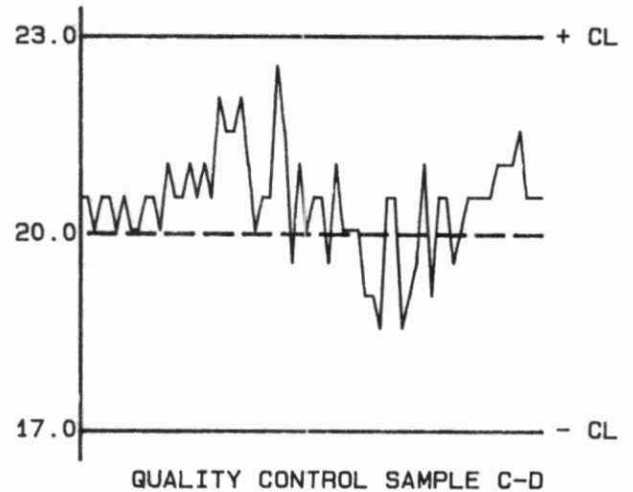
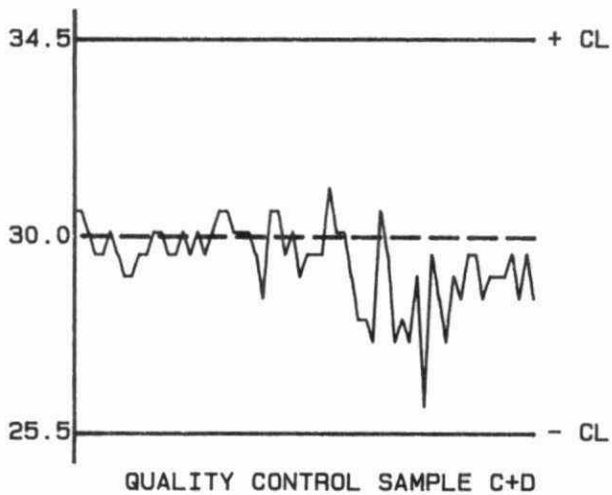
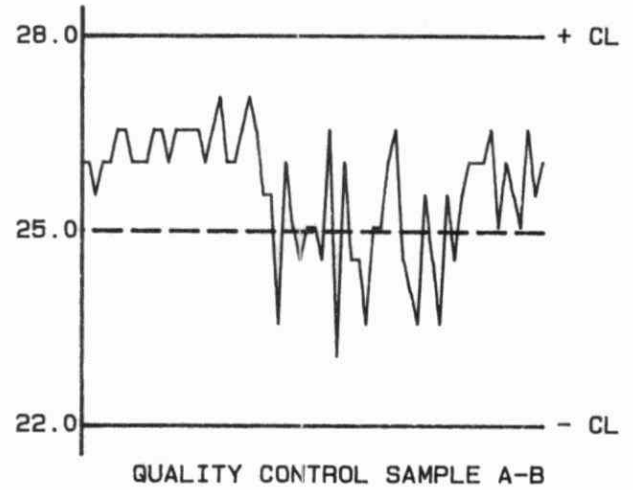
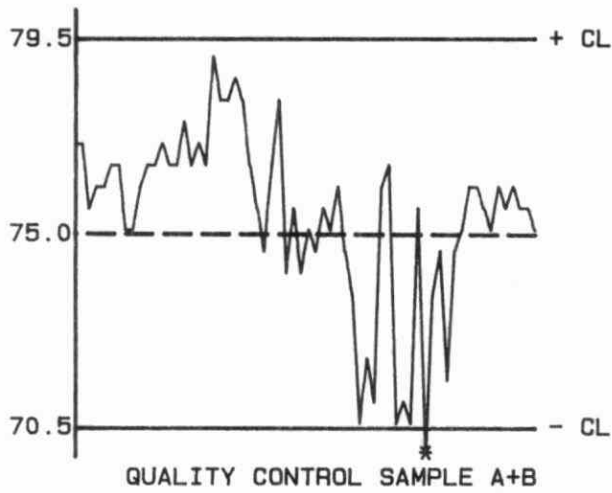
70.5 to 79.5 for A+B
22.0 to 28.0 for A-B
25.5 to 34.5 for C+D
17.0 to 23.0 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	21	0.0 - 5.0	0.37	17.7
	35	5.0 - 10.0	0.69	9.2
	54	10.0 - 25.0	0.88	5.0
	49	25.0 - 50.0	0.97	2.5
	25	50.0 - 100.0	1.34	2.1
	184	Overall	0.91	N/A

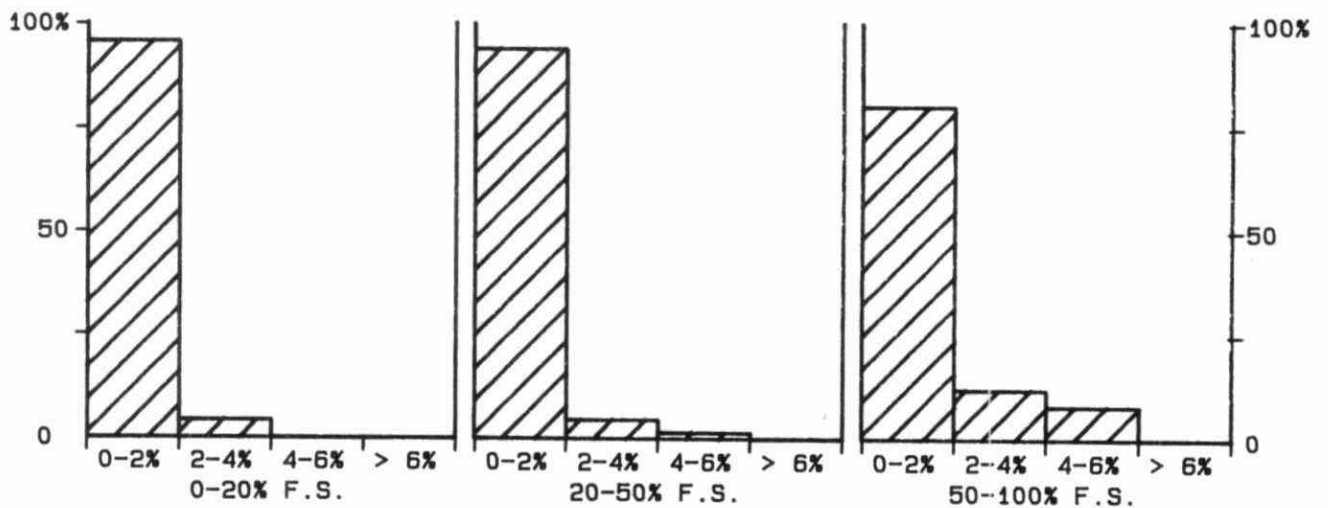
DETECTION CRITERION: 1.1

QUALITY CONTROL GRAPHS COLOUR-TRUE (TCU)

FROM: 03/01/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 TCU

66
*** COLOUR - APPARENT ***

IDENTIFICATION:

Laboratory	: Dorset	Method Introduced:	15/10/80
Supervisor	: F. Tomassini	Units	: Hazen Units
Sample Type/Matrix:	Streams, Lakes		

SAMPLING:

Quantity Required: 75 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Apparent colour is measured colourimetrically in a system calibrated with acidified chloroplatinate standards. Colour is measured using a broadband blue filter. Turbidity effects are partially suppressed by using a broadband red filter. Apparent colour is calculated from the two absorbance measurements using an empirically derived equation. If colour reads >70 or turbidity reads >20, true colour is reported after settling plus dilution if required.
Approximate absorbance: 0.05 at the 70 true colour level.

INSTRUMENTATION:

Two colourimeters, one with broadband blue filter(400-450nm) and the other with broadband red filter(660-740nm). Colourimetric measurement is through a 4.0 cm light path.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 1	Detection Criterion (T):4

CALIBRATION:

BL plus 1 standard

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA

NOTES:

Slope factor is changed whenever light source in a colourimeter is replaced. This is accomplished by analyzing 7 standards.

COLOR-APPARENT
QUALITY CONTROL DATA FROM 09/01/85 TO 18/12/85

Lab: Dorset

Analytical Range: 4 to 100 HU

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	161	50	50	0	1.1
b :	161	10	10	0	0.6
a+b :	161	60	59	-1	1.5
a-b :	161	40	40	0	0.9

s.d.(AB): Sw(within run): 0.6 S(between runs): 0.9 S/Sw: 1.39

On any given day the calibration is accepted if the values obtained lie within the ranges:

53 to 67 for A+B
 35 to 45 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	54	0 - 10	1.2	20.1
	70	10 - 25	1.4	8.0
	151	25 - 50	1.6	4.5
	148	50 - 100	2.0	2.7
	423	Overall	1.7	N/A

DETECTION CRITERION: 4

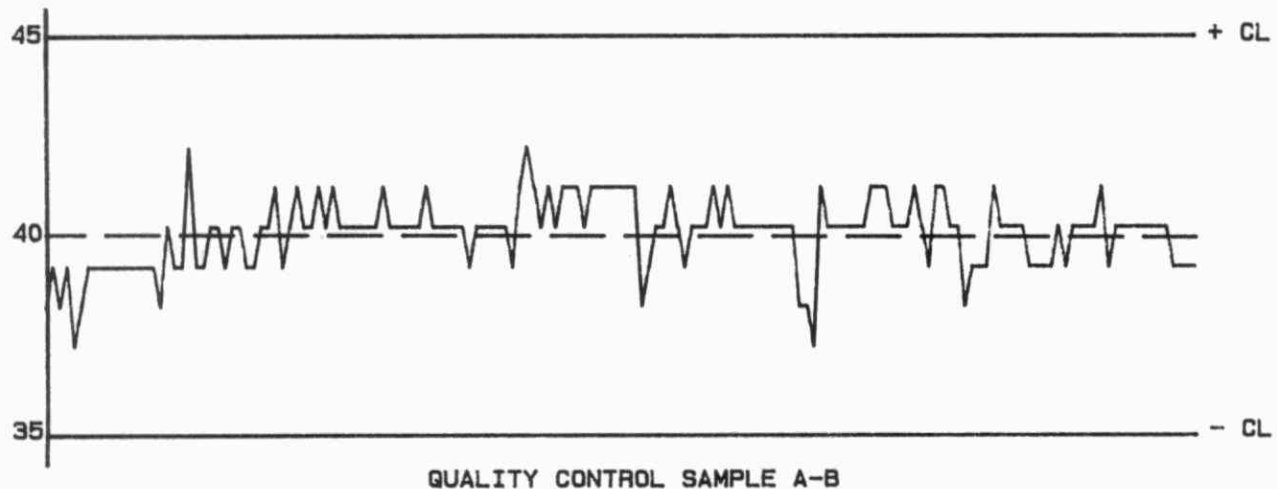
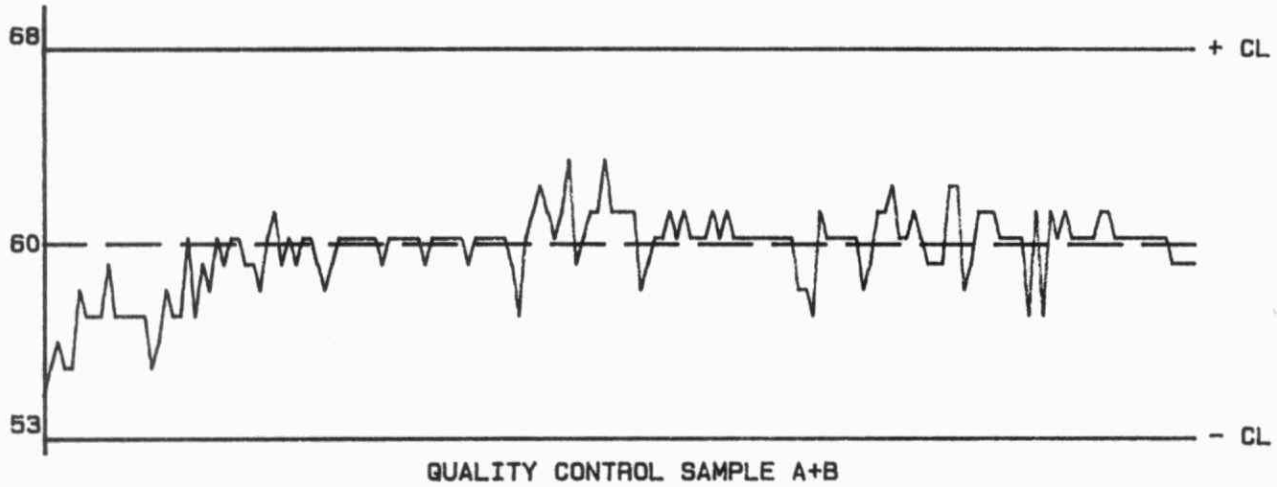
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	159	0	0.0

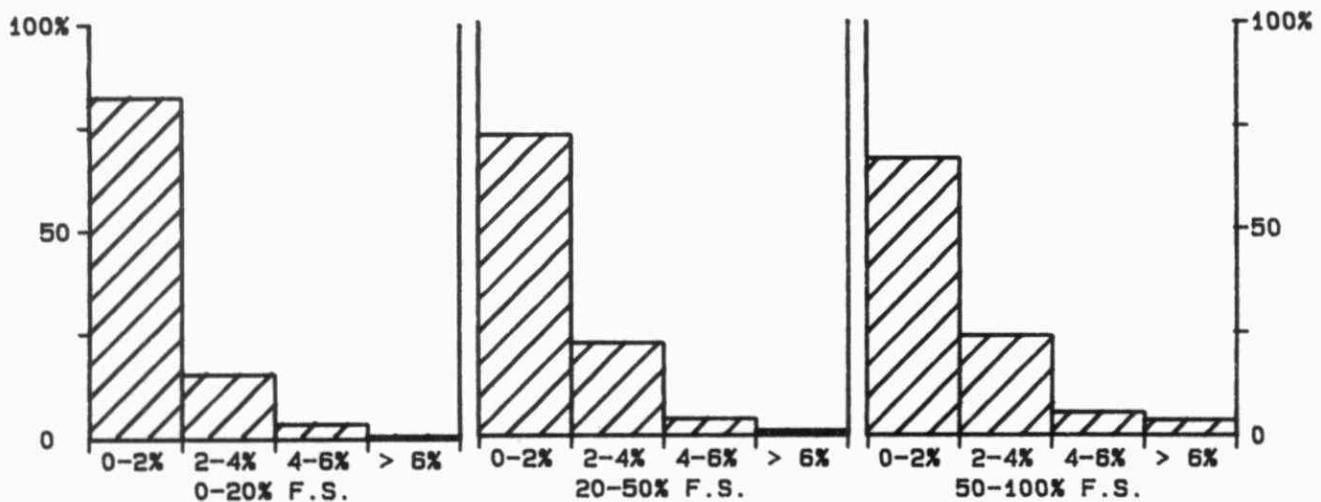
QUALITY CONTROL GRAPHS COLOR-APPARENT (HU)

FROM: 09/01/85

TO: 18/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 HU

*** COLOUR-TRUE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	28/02/84
LIS Test Name Code:	COLTR	Units	: TCU
Work Station Code	: RCOL	Unit Code	: 342000
Method Code	: 102BC9	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Soil Extracts, Effluents.			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

Approximate absorbance: 0.05 at the 70 TCU level.

INSTRUMENTATION:

Basic automated modular continuous flow system. Colour measurement is through a 3.0 cm. light path using a broadband filter(400-450nm). Turbidity measurement is through a 5.0 cm. light path using a different broadband filter(660-740nm).

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.1	Detection Criterion (T): 1.6

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA
Drift : BL plus 1 standard

NOTES:

New procedure was initiated to conform with change in "Ontario Drinking Water Objectives"; copy of research study is available on request.

22/08/85 -RCOL workstation was phased out. Samples received subsequently were run on WCOL.

No data summary is available for period not covered in performance report.

COLOUR-TRUE
QUALITY CONTROL DATA FROM 05/02/85 TO 22/08/85

Lab: Rivers and Lakes

Analytical Range: 1.6 to 100.0 TCU

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	27	50.0	50.9	0.9	1.40
b :	27	25.0	25.0	0.0	0.40
a+b :	27	75.0	76.0	1.0	1.47
a-b :	27	25.0	25.9	0.9	1.45

s.d.(AB): S_w(within run): 1.03 S(between runs): 1.03 S/S_w: 1.00

On any given day the calibration is accepted if the values obtained lie within the ranges:

70.5 to 79.5 for A+B
 22.0 to 28.0 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	19	0.0 - 10.0	0.53	9.9
	27	10.0 - 25.0	0.51	2.9
	14	25.0 - 50.0	0.45	1.2
	7	50.0 - 100.0	0.33	0.4
	67	Overall	0.48	N/A

DETECTION CRITERION: 1.6

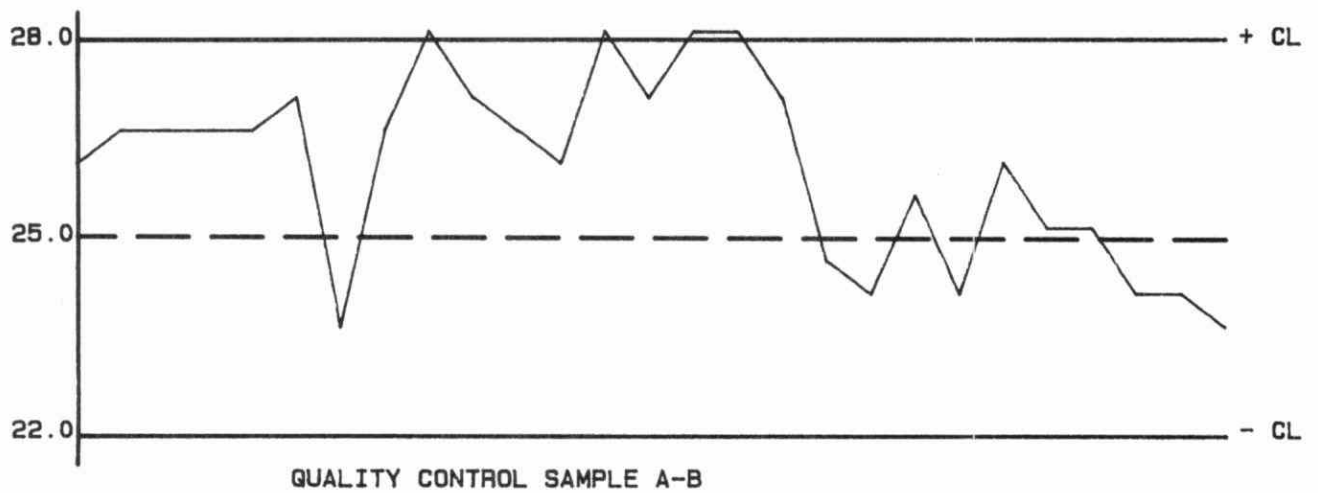
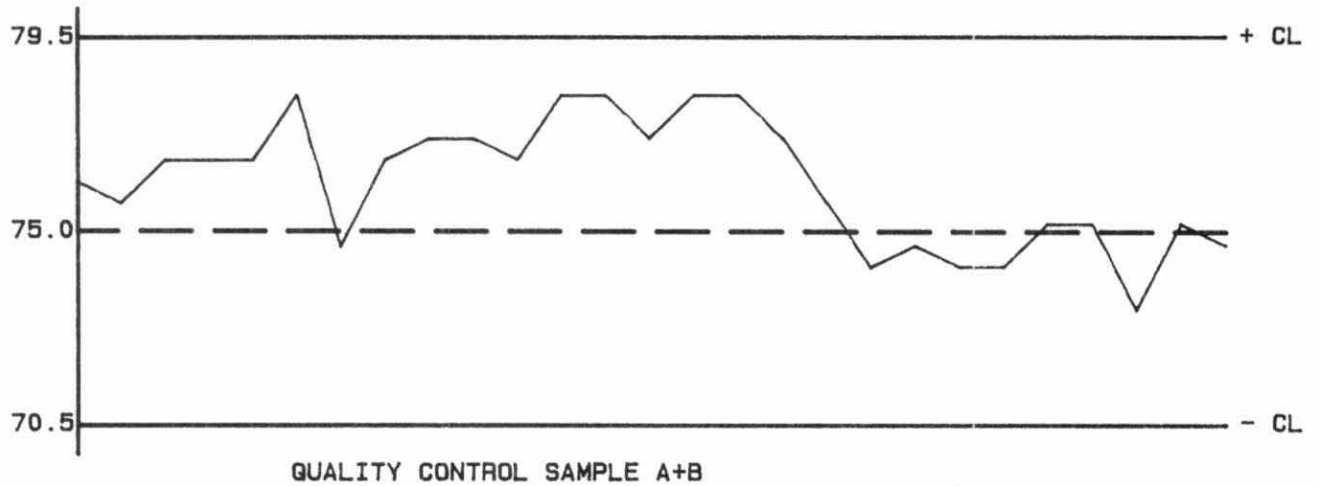
OTHER CHECKS:

		Number of Data	Data Mean	Standard(1) Deviation
STD.CAL	:	27	414	49.4
Long Term Blank	:	26	0.0	0.07

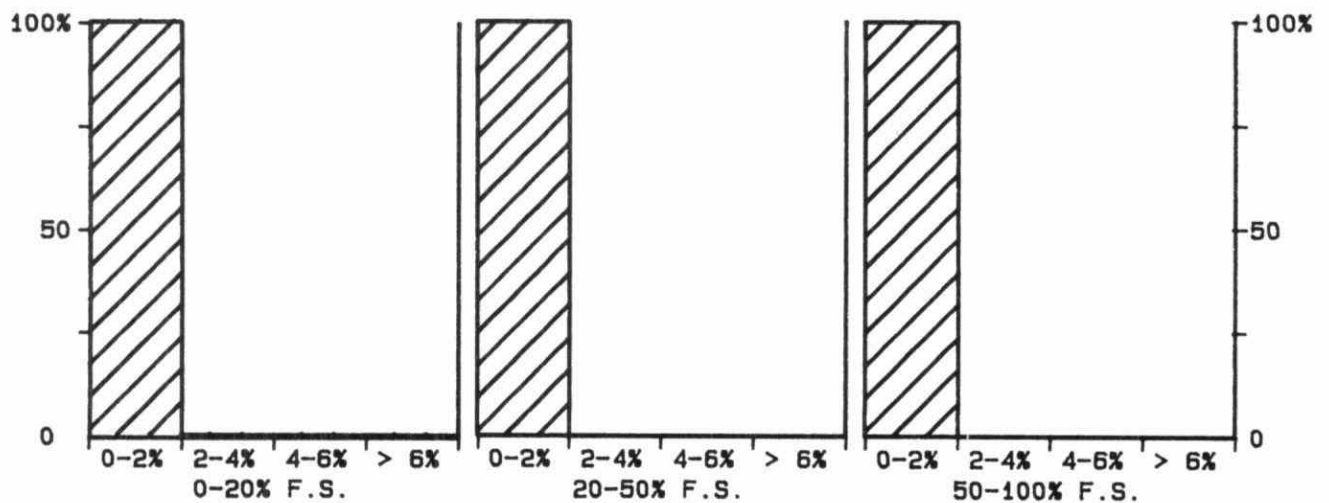
QUALITY CONTROL GRAPHS COLOUR-TRUE (TCU)

FROM: 05/02/85

TO: 22/08/85



--- EXPECTED VALUE
 — CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 100 TCU

*** CONDUCTIVITY ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	Before '74
LIS Test Name Code:	COND25	Units	: uS/cm at 25 C
Work Station Code	: WPC	Unit Code	: 350351
Method Code	: 002A12	Supervisor	: M. Rawlings
Sample Type/Matrix:	Domestic Waters, Leachates		

SAMPLING:

Quantity Required: 75 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

The sample is introduced into a jacketed conductivity cell and equilibrated to 25 C. The conductivity is read directly from a digital display.

INSTRUMENTATION

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator.

REPORTING:

Maximum Significant Figures: 4
Minimum Increment (W) : 1 Detection Criterion (T): 3

CALIBRATION:

Standard resistor

CONTROLS:

Calibration: BL plus 3 standards, eg, QCA

CONDUCTIVITY
QUALITY CONTROL DATA FROM 02/01/85 TO 30/12/85

Lab: Domestic Water

Analytical Range: 3 to 5000 uS/cm

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	183	1399	1401	2	10.2
b :	183	477	479	2	4.6
a+b :	183	1876	1880	4	13.7
a-b :	183	922	923	1	8.0
c :	183	477	479	2	4.6
d :	183	193	195	2	1.7
c+d :	183	670	674	4	5.7
c-d :	183	284	284	0	3.8

s.d.(AB): SW(within run): 5.7 S(between runs): 7.9 S/SW: 1.40
s.d.(CD): SW(within run): 2.7 S(between runs): 3.5 S/SW: 1.29

On any given day the calibration is accepted if the values obtained lie within the ranges:

1801 to 1951 for A+B
872 to 972 for A-B
640 to 700 for C+D
264 to 304 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	36	0 - 130	1.0	1.3
	213	130 - 500	1.5	0.5
	129	500 - 1300	2.2	0.3
	16	1300 - 2500	2.5	0.1
	10	2500 - 5000	19.1	0.6
	404	Overall	3.5	N/A

DETECTION CRITERION: 3

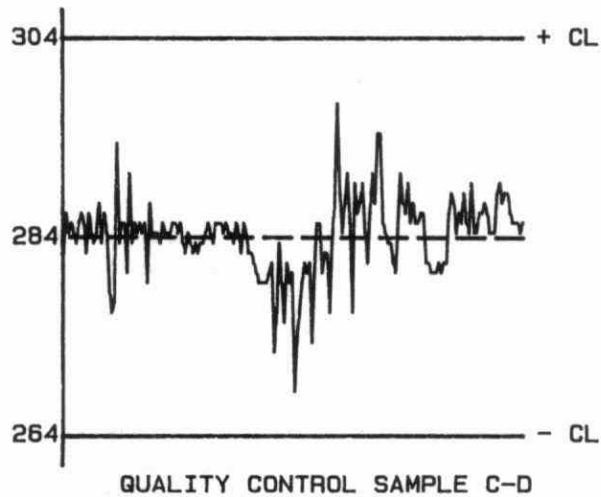
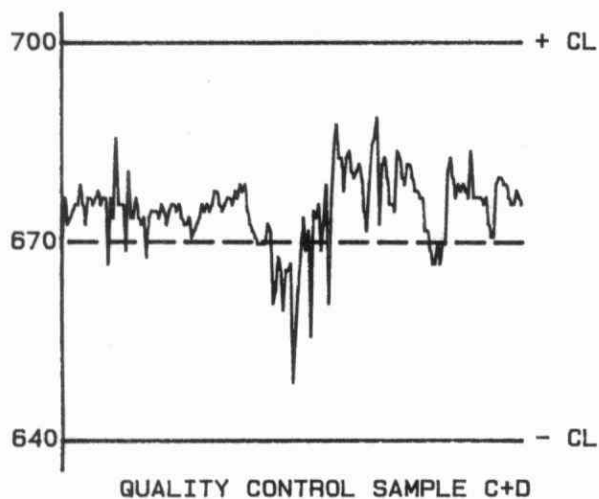
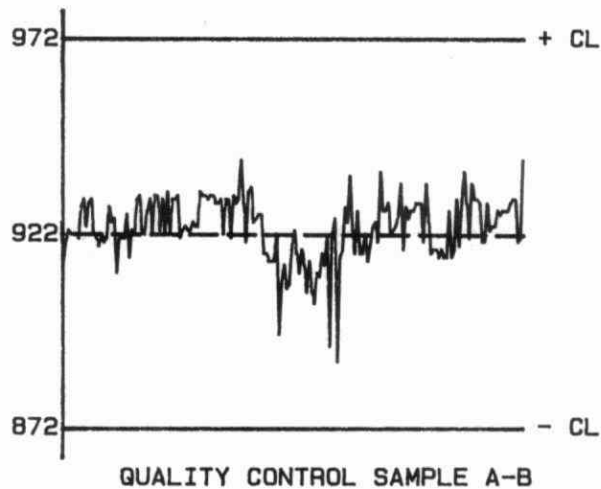
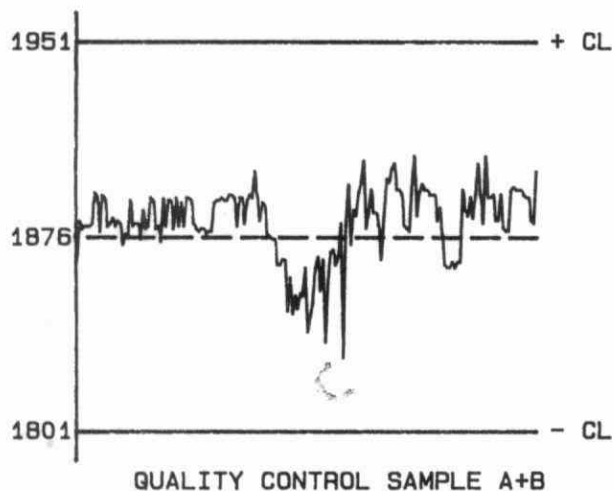
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Std Resistor :	183	1590	0.0

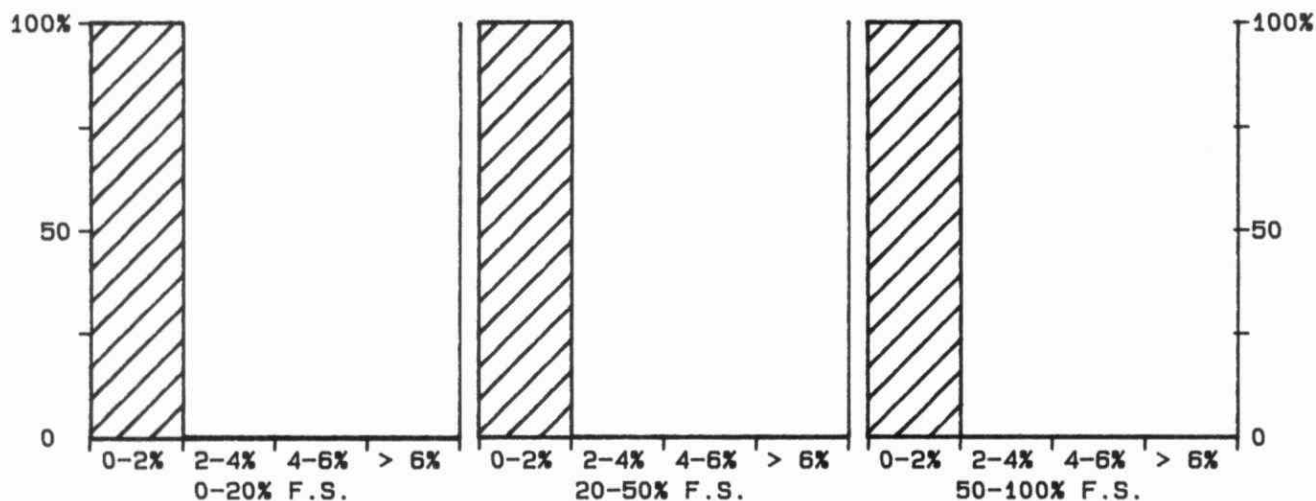
QUALITY CONTROL GRAPHS CONDUCTIVITY (US/CM)

FROM: 02/01/85

TO: 30/12/85



--- EXPECTED VALUE
 — CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 5000 US/CM

*** CONDUCTIVITY ***

IDENTIFICATION:

Laboratory : Dorset Methods Introduced: 01/06/76
Supervisor : F. Tomassini Units : uS/cm at 25 C
Sample Type/Matrix: Streams, Lakes, Precipitation

SAMPLING:

Quantity Required: 75 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

The sample is introduced into a jacketed conductivity cell and equilibrated to 25 C. The conductivity is read directly from a digital display.

INSTRUMENTATION:

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator.

REPORTING:

Maximum Significant Figures: 4
Minimum Increment (W) : 0.1 Detection Criterion (T): 1.3*

CALIBRATION:

None

CONTROLS:

Calibration: BL plus 2 standards, eg, QCA

NOTES:

*T value is based on duplicate analyses at concentrations above the lowest range.

CONDUCTIVITY
QUALITY CONTROL DATA FROM 09/01/85 TO 16/12/85

Lab: Dorset

Analytical Range: N/A to 300 uS/cm

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	164	290	292	2	1.4
b :	164	74	75	1	0.5
a+b :	164	364	367	3	1.5
a-b :	164	216	217	1	1.4

s.d.(AB): Sw(within run): 1.0 S(between runs): 1.1 S/Sw: 1.06

On any given day the calibration is accepted if the values obtained lie within the ranges:

351 to 377 for A+B
 207 to 225 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
0	0.0 - 10.0	N/A	N/A
9	10.0 - 20.0	0.43	2.4
361	20.0 - 50.0	0.47	1.4
27	50 - 100	0.6	0.9
38	100 - 300	1.1	0.8
435	Overall	0.6	N/A

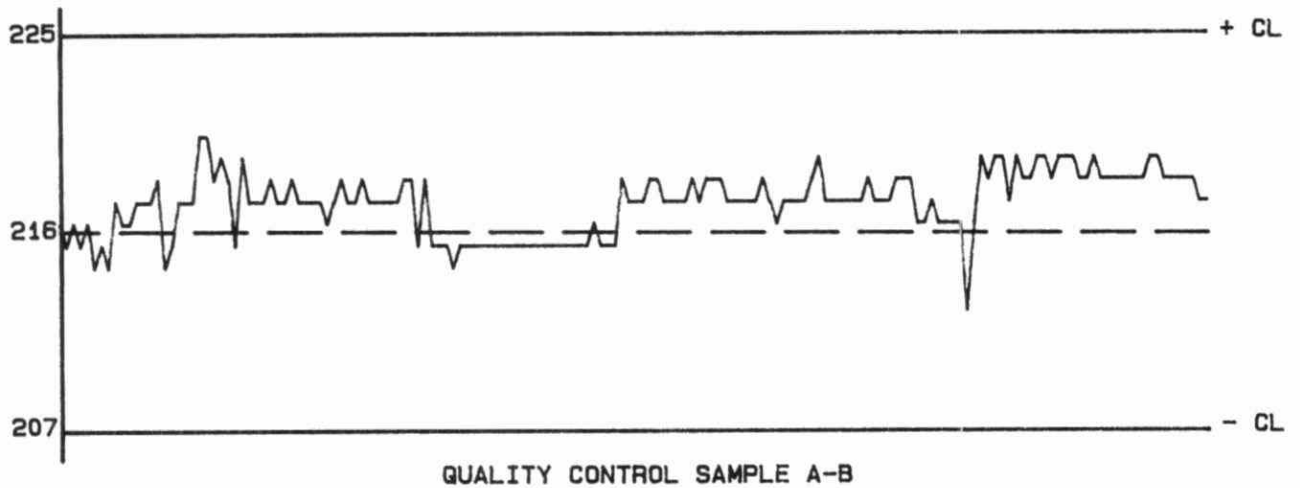
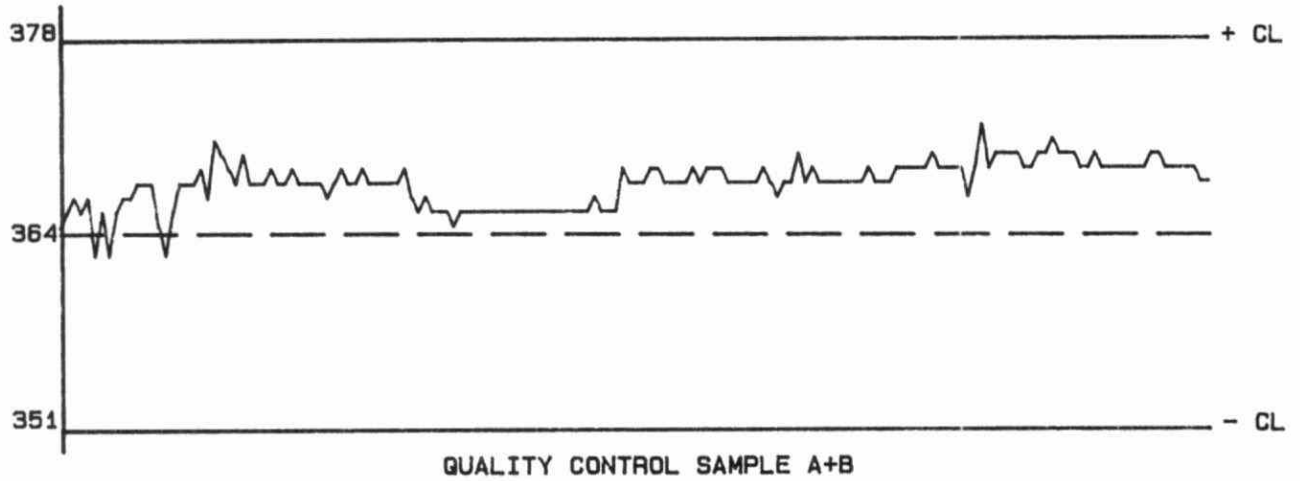
DETECTION CRITERION: N/A

OTHER CHECKS:

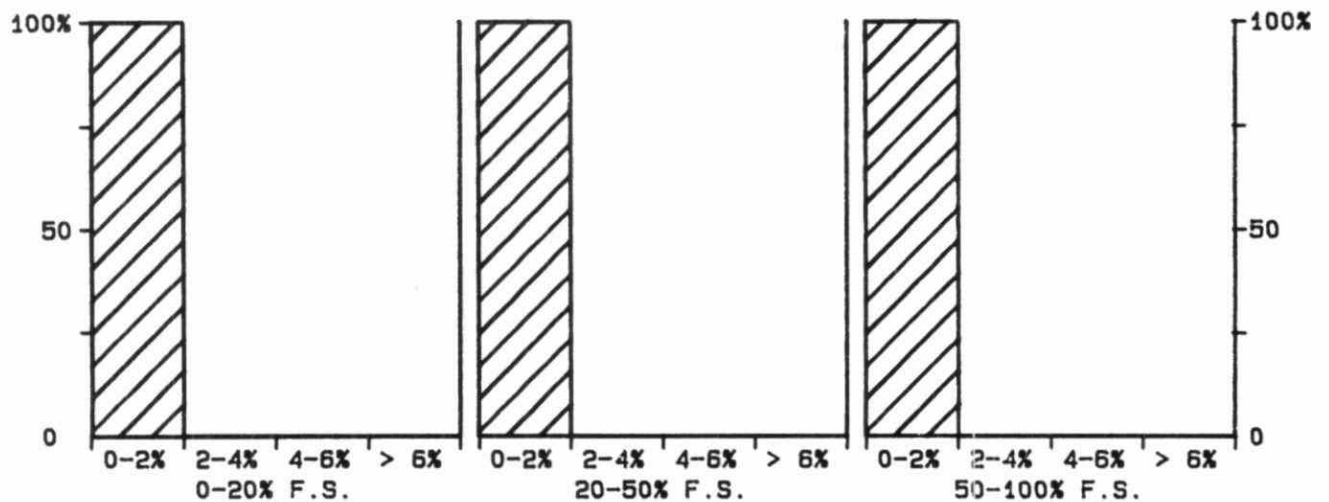
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	163	1	0.3

QUALITY CONTROL GRAPHS CONDUCTIVITY (US/CM)

FROM: 09/01/85
TO: 16/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 300 US/CM

*** CONDUCTIVITY ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/04/78
LIS Test Name Code:	COND25	Units	: uS/cm at 25 C
Work Station Code	: PRIC1	Unit Code	: 350351
Method Code	: 002A12	Supervisor	: M Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow			

SAMPLING:

Quantity Required: 15 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

After equilibration at 25 C, the conductivity of the sample is measured.

INSTRUMENTATION:

Automated modular continuous flow conductivity system comprised of sampler, water bath, conductivity meter with cell, chart recorder.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.1	Detection Criterion (T): 0.9

CALIBRATION:

Comparability between conductivity meter and chart recorder is confirmed by checking 3 standard resistances

CONTROLS:

Calibration: LTBL plus 2 standards, eg, QCA
Drift : 1 solution every 10 samples

MODIFICATIONS:

18/10/83 -Automated continuous flow system was introduced.

NOTES:

A calibration standard for the ion chromatographic system is utilized as a drift control for the conductivity system, but its theoretical conductivity is unknown.

CONDUCTIVITY
QUALITY CONTROL DATA FROM 02/01/85 TO 19/12/85

Lab: Precipitation

Analytical Range: 0.9 to 100.0 uS/cm

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	129	44.5	46.1	1.6	0.95
b :	129	7.5	8.8	1.3	0.77
a+b :	129	52.0	54.8	2.8	1.47
a-b :	129	37.0	37.3	0.3	0.91

s.d.(AB): Sw(within run): 0.64 S(between runs): 0.86 S/Sw: 1.34

On any given day the calibration is accepted if the values obtained lie within the ranges:

41.5 to 62.5 for A+B
 30.0 to 44.0 for A-B

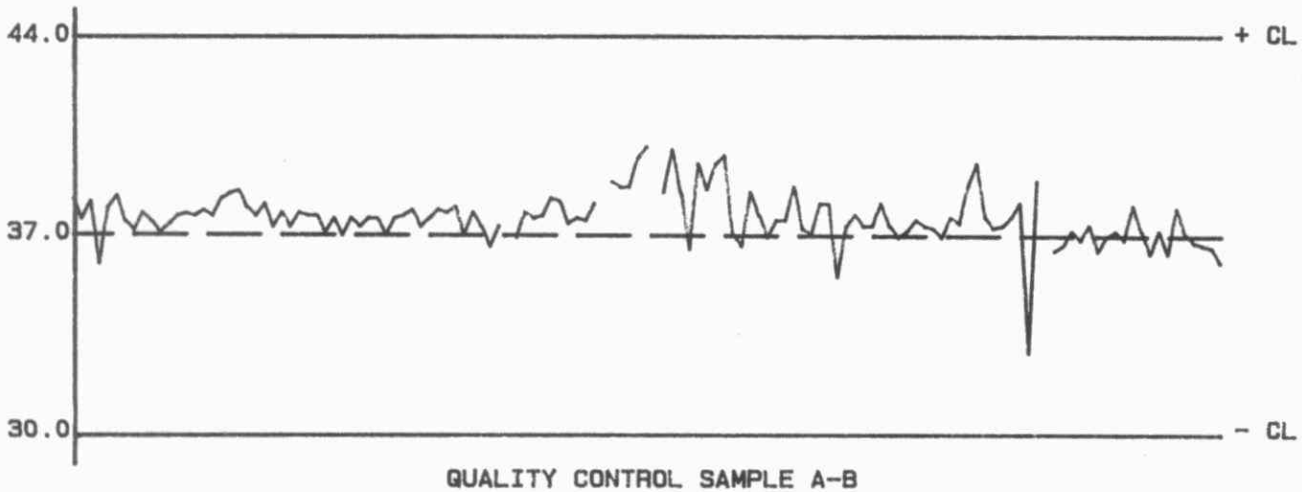
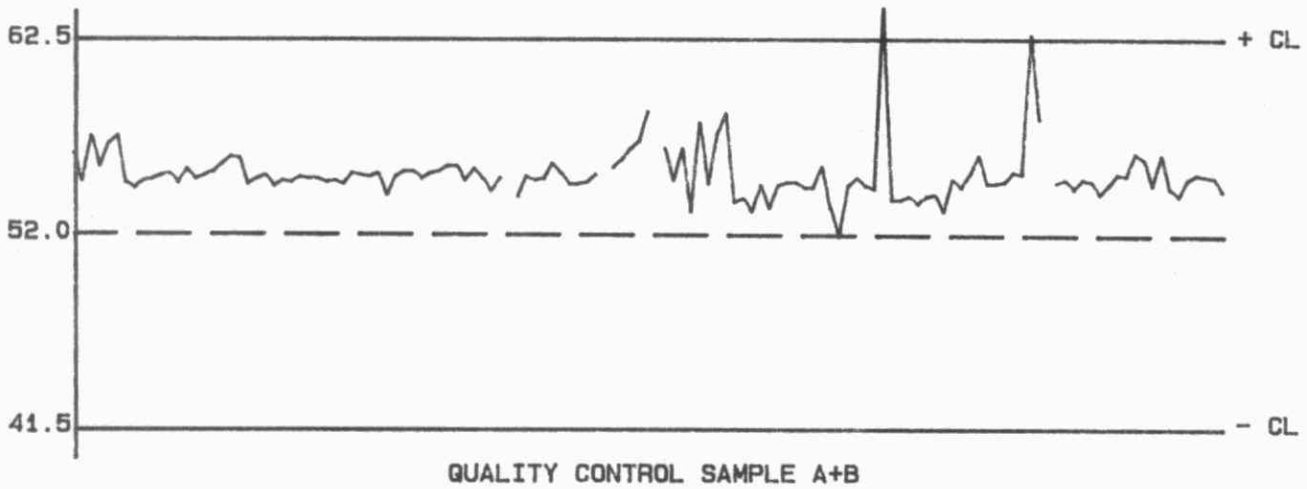
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	13	0.0 - 10.0	0.31	4.0
	21	10.0 - 20.0	0.55	3.8
	77	20.0 - 50.0	1.16	3.4
	28	50.0 - 100.0	3.15	4.5
	139	Overall	1.67	N/A

DETECTION CRITERION: 0.9

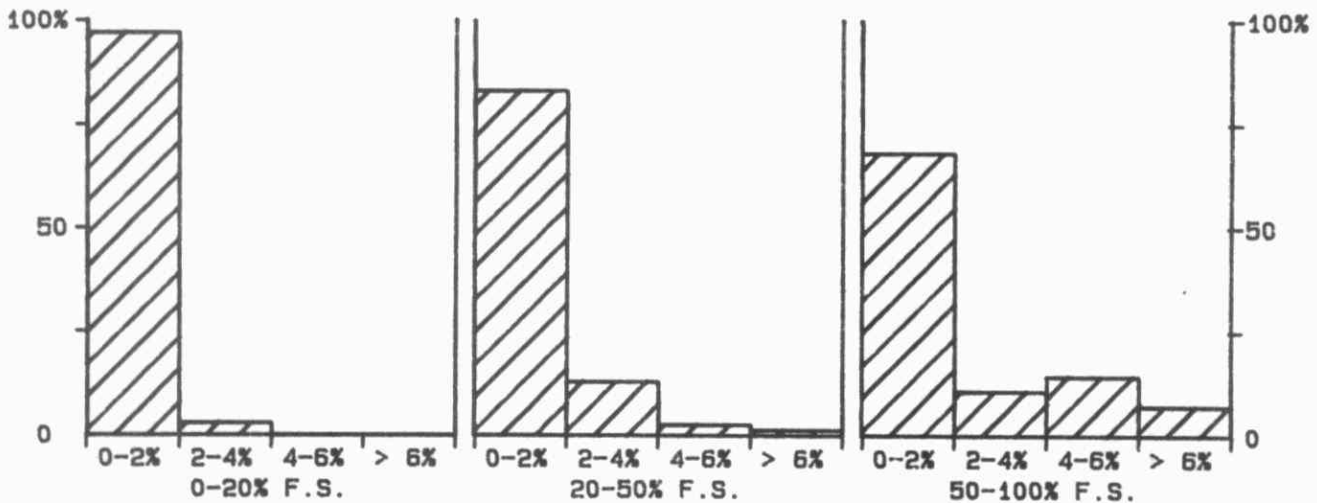
QUALITY CONTROL GRAPHS CONDUCTIVITY (US/CM)

FROM: 02/01/85

TO: 19/12/85



--- EXPECTED VALUE
 --- CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 100 US/CM

*** CONDUCTIVITY ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	COND25	Units	: uS/cm at 25 C
Work Station Code	: ROCONTUR,RATS	Unit Code	: 350351
Method Code	: 002B12	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts, Effluents		

SAMPLING:

Quantity Required: 25 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25 C, the conductivity of the sample is measured.

INSTRUMENTATION:

Automated modular continuous flow conductivity system comprising sampler, water bath, conductivity meter with cell, microcomputer.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 1 Detection Criterion (T): 2

CONTROLS:

Calibration : LTBL plus 4 standards, eg, QCA
Drift : In run standards throughout the run, diluted tap water (20%V/V)

MODIFICATIONS:

01/04/84 -Automated system introduced for conductivity range 20-1000 uS/cm.
09/05/85 -Analytical stream is not flowing during conductivity measurement.
Radiometer conductivity meter was changed from model CDM 3 to model CDM 83. The analytical range was expanded: 1 to 3000 uS/cm. This expansion was feasible due to the use of the auto-ranging CDM 83 module.

NOTES:

No data summary is available for period not covered in performance report.

CONDUCTIVITY
QUALITY CONTROL DATA FROM 14/03/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: 2 to 2000 uS/cm

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	111	718	718	0	3.1
b :	112	147	148	1	1.2
a+b :	111	865	867	2	3.6
a-b :	111	571	570	-1	3.0
c :	112	147.0	148.5	1.5	1.24
d :	112	37.1	38.3	1.2	0.39
c+d :	112	184.1	186.8	2.7	1.51
c-d :	112	109.9	110.2	0.3	1.05

s.d.(AB): SW(within run): 2.1 S(between runs): 2.4 S/SW: 1.11
s.d.(CD): SW(within run): 0.74 S(between runs): 0.92 S/SW: 1.24

On any given day the calibration is accepted if the values obtained lie within the ranges:

775 to 955 for A+B
511 to 631 for A-B
178.1 to 190.1 for C+D
105.9 to 113.9 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	57	0.0 - 50	0.7	2.0
	86	50 - 200	0.8	0.8
	102	200 - 500	1.4	0.4
	60	500 - 1000	1.9	0.3
	11	1000 - 2000	2.5	0.2
	316	Overall	1.3	N/A

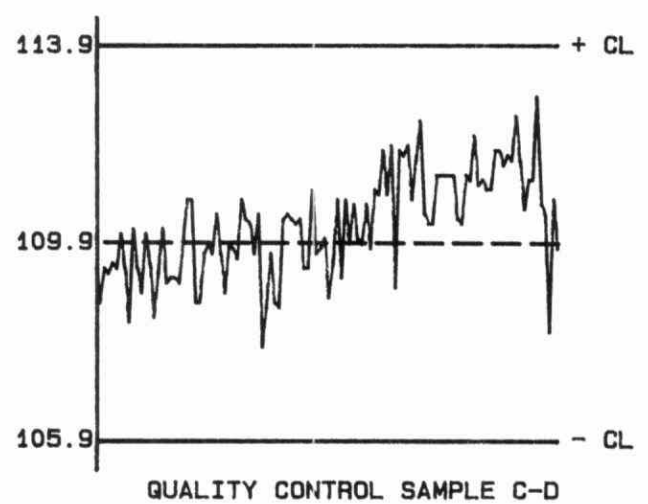
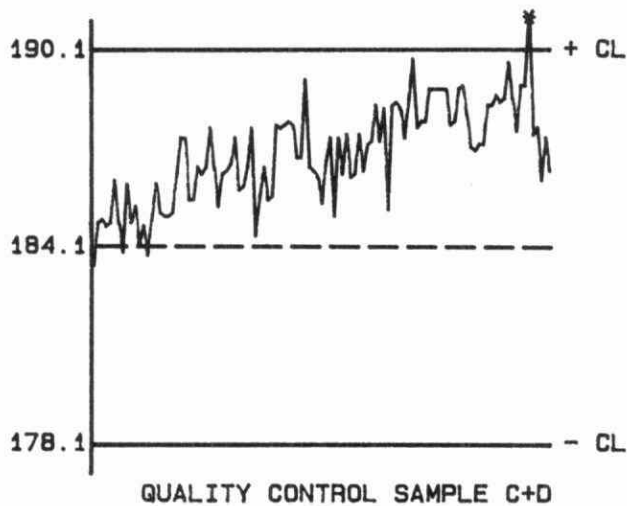
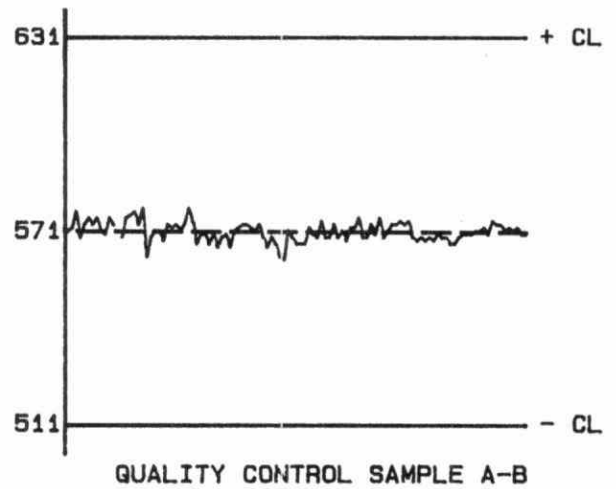
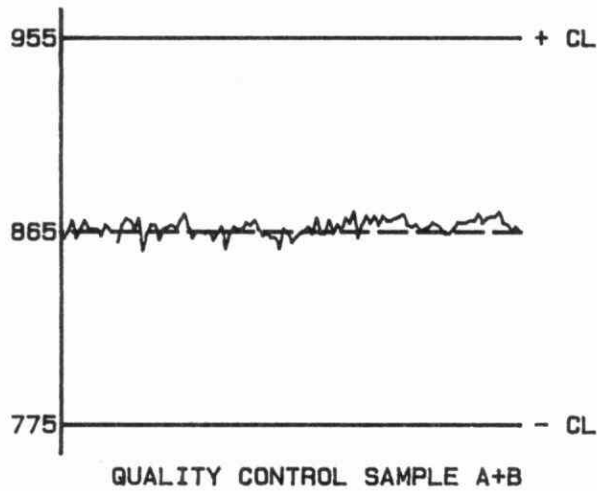
DETECTION CRITERION: 2.1

OTHER CHECKS:

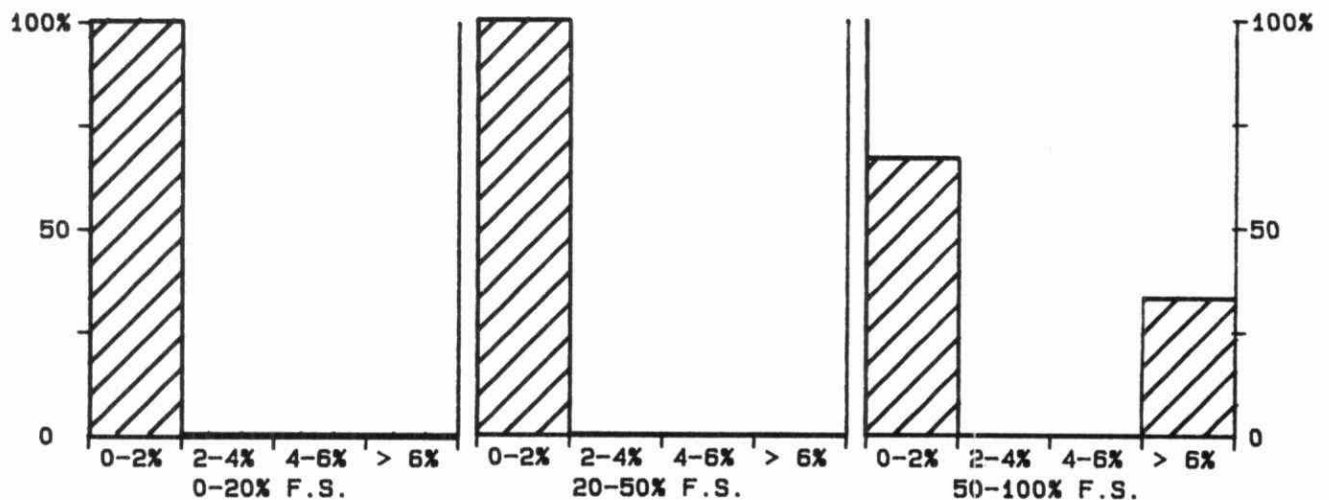
	Number of Data	Data Mean	Standard(1) Deviation
Cell Const :	10	3.28	0.000

QUALITY CONTROL GRAPHS CONDUCTIVITY (US/CM)

FROM: 14/03/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 3000 US/CM

*** CONDUCTIVITY ***

IDENTIFICATION:

Laboratory	: Sewage/Industrial	Method Introduced:	Before '74
LIS Test Name Code:	COND25	Units	: uS/cm at 25 C
Work Station Code	: COND-SEW	Unit Code	: 350351
Method Code	: 002A12	Supervisor	: P. Campbell
Sample Type/Matrix:	Sewage, Industrial Waste, Effluents		

SAMPLING:

Quantity Required: 75 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

The filtered sample is introduced into a jacketed conductivity cell and equilibrated to 25 C. The conductivity is read directly from an analog display.

INSTRUMENTATION

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator.

REPORTING:

Maximum Significant Figures:	3	
Minimum Increment (W) :	1	Detection Criterion (T): 4

CALIBRATION:

None

CONTROLS:

Calibration: BL plus 3 standards, eg, QCA

CONDUCTIVITY
QUALITY CONTROL DATA FROM 04/01/85 TO 23/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 4 to 3000 uS/cm

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	38	1413	1410	-3	4.1
b :	38	717.8	717.6	-0.2	2.15
a+b :	38	2130.8	2127.3	-3.5	5.54
a-b :	38	695.2	692.1	-3.1	3.56

s.d.(AB): Sw(within run): 2.5 S(between runs): 3.3 S/Sw: 1.30

On any given day the calibration is accepted if the values obtained lie within the ranges:

2040.8 to 2220.8 for A+B
 635.2 to 755.2 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	22	0 - 500	1.2	0.4
	28	500 - 1000	0.8	0.1
	15	1000 - 1500	4.1	0.3
	1	1500 - 3000	N/A	N/A
	66	Overall	2.1	N/A

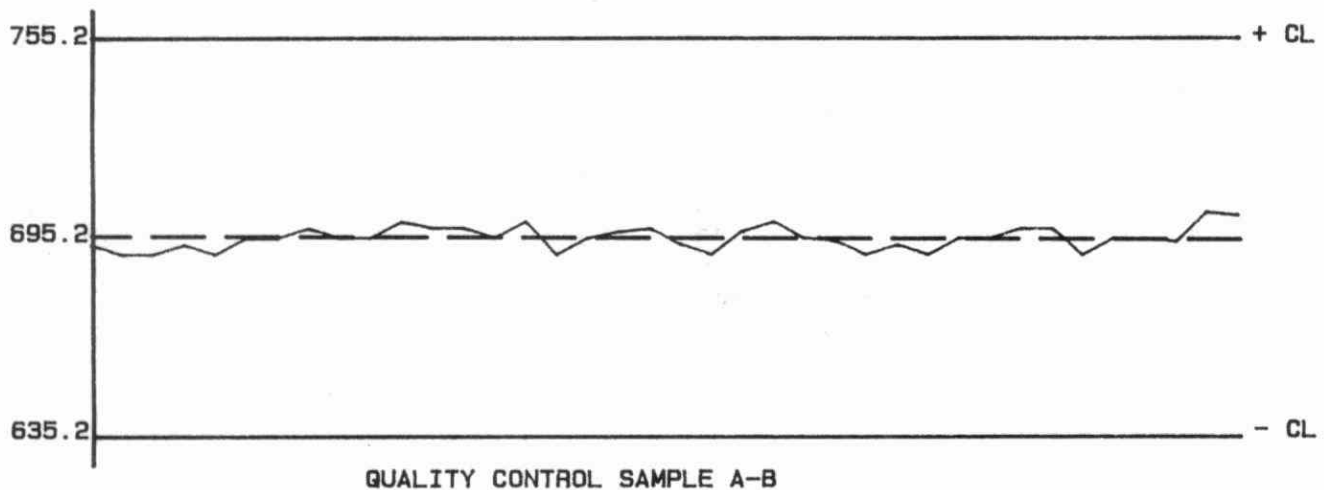
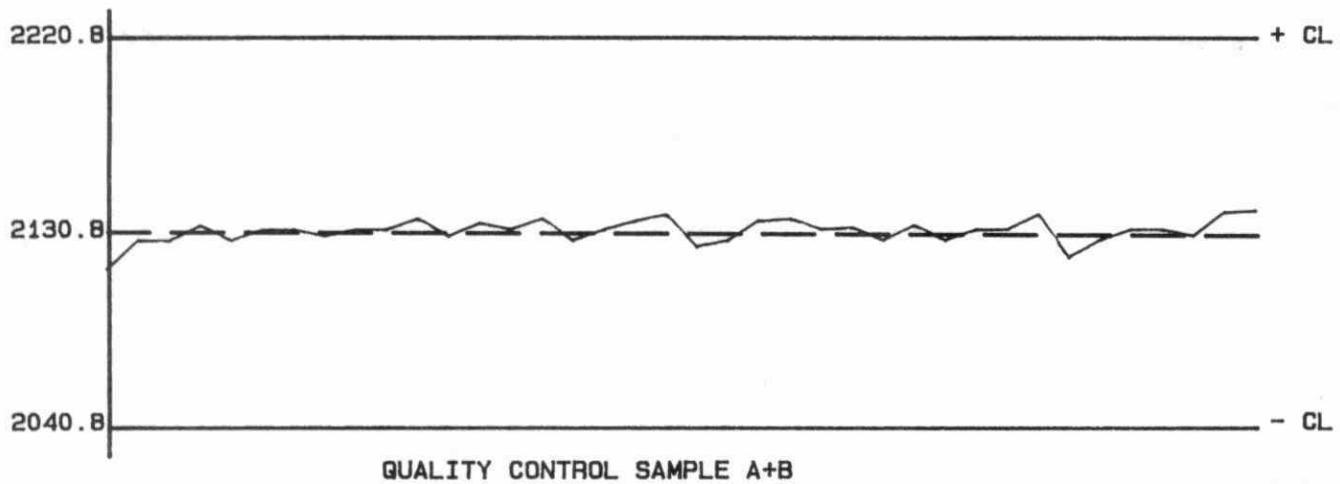
DETECTION CRITERION: 4

OTHER CHECKS:

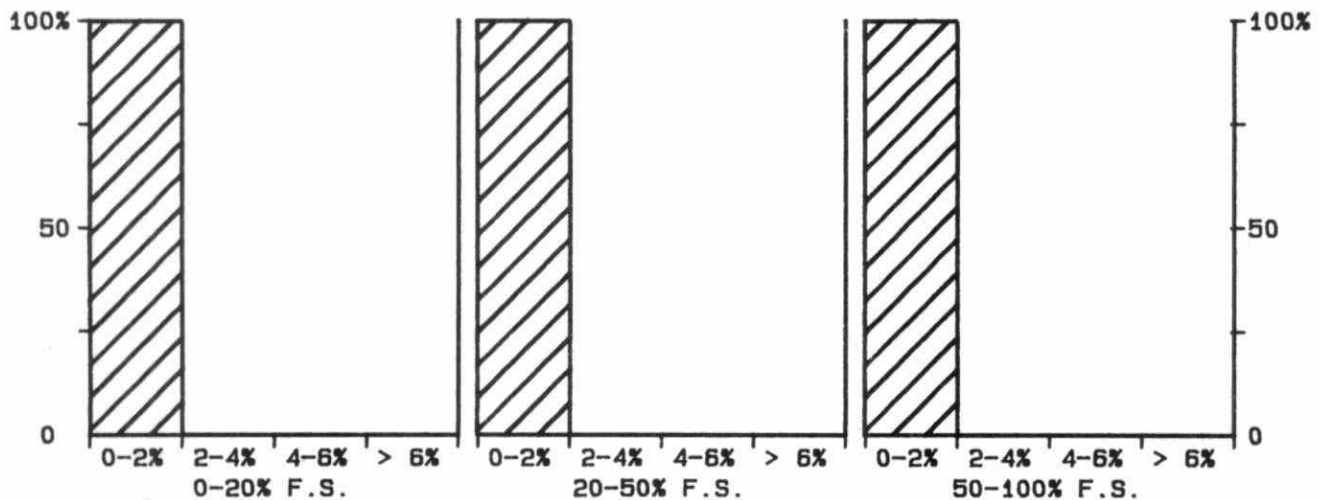
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	38	1.20	0.572

QUALITY CONTROL GRAPHS CONDUCTIVITY (US/CM)

FROM: 04/01/85
TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 3000 US/CM

*** FLUORIDE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/03/78
LIS Test Name Code:	FFIDUR	Units	: ug/L as F
Work Station Code	: WSPF	Unit Code	: 063809
Method Code	: 001AIE	Supervisor	: M. Rawlings
Sample Type/Matrix:	Precipitation, Lakes, Streams		

SAMPLING:

Quantity Required: 50 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Fluoride is determined via an automated flow system for which the detector is a specific ion electrode; prior to measurement the sample is mixed with a high ionic strength buffer containing: sodium citrate, disodium ethylenediaminetetraacetate(EDTA), phosphoric acid, and sufficient sodium hydroxide to obtain pH 6.7

INSTRUMENTATION:

Automated modular continuous flow ion specific electrode system.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.1	Detection Criterion (T): 1.4

CALIBRATION:

BL plus 1 standard in duplicate

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL plus 1 standard
Interference: Combined fluoride and aluminum standard confirms that aluminum is not an interference.

MODIFICATIONS:

01/03/82- The above procedure is not described in HAMES, but a copy of the development report is available on request. The manual procedure in HAMES for the determination of fluoride by specific ion electrode is similar.

NOTES:

At the present time this procedure is restricted to special projects.

FLUORIDE
QUALITY CONTROL DATA FROM 16/01/85 TO 24/12/85

Lab: Domestic Water

Analytical Range: 1.4 to 70.0 ug/L as F

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	77	48.0	48.3	0.3	0.64
b :	77	24.0	24.2	0.2	0.74
a+b :	77	72.0	72.4	0.4	1.16
a-b :	77	24.0	24.1	0.1	0.76

s.d.(AB): Sw(within run): 0.54 S(between runs): 0.69 S/Sw: 1.29

On any given day the calibration is accepted if the values obtained lie within the ranges:

68.3 to 75.7 for A+B
 21.6 to 26.5 for A-B

DUPLICATES:

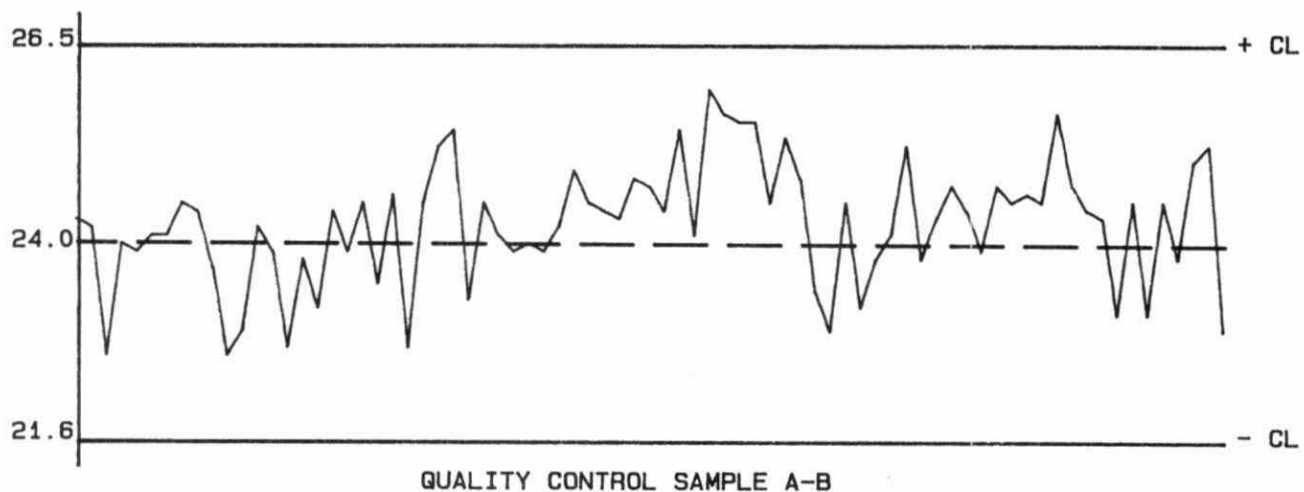
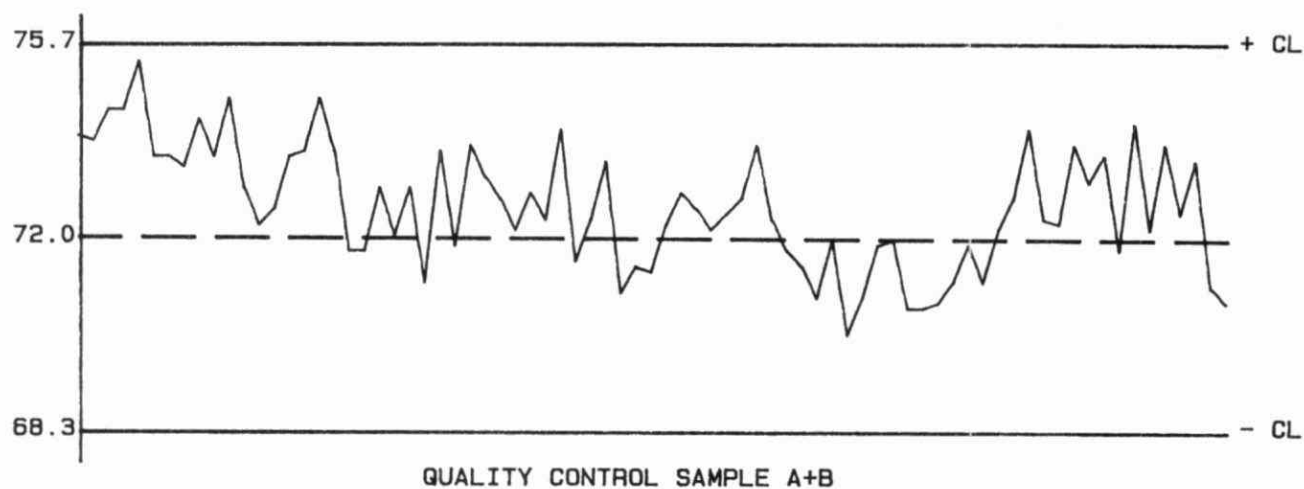
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
3	0.0 - 10.0	0.48	7.1
10	10.0 - 30.0	0.82	4.2
119	30.0 - 50.0	0.81	1.9
63	50.0 - 70.0	0.85	1.5
195	Overall	0.82	N/A

DETECTION CRITERION: 1.4**OTHER CHECKS:**

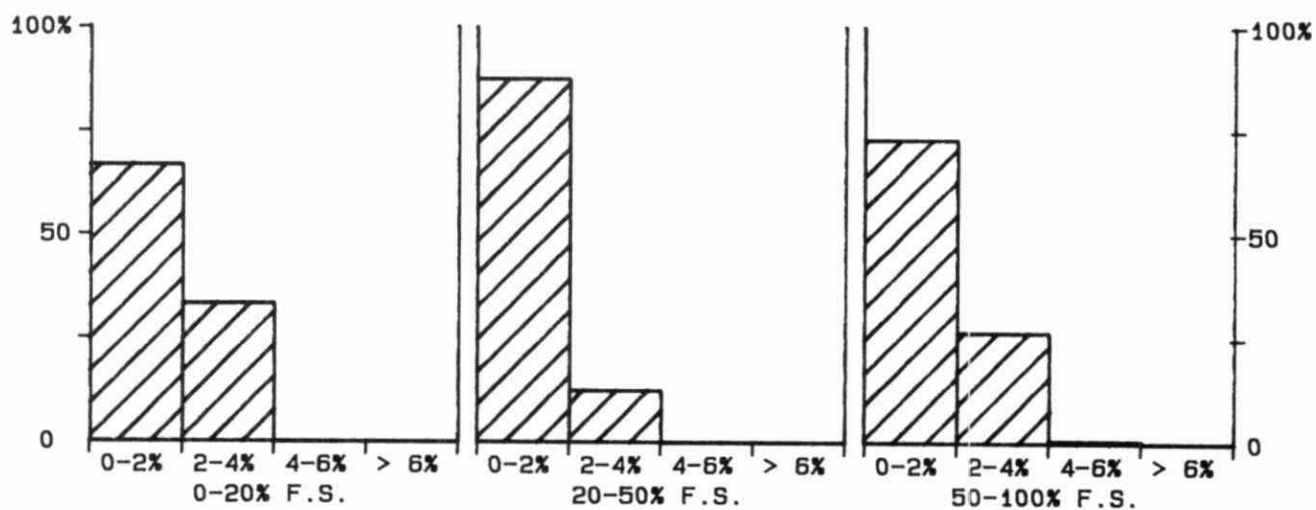
	Number of Data	Data Mean	Standard(1) Deviation
60ug/L F+500ug/L Al :	76	60.1	1.00

QUALITY CONTROL GRAPHS FLUORIDE (UG/L AS F)

FROM: 16/01/85
TO: 24/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 70 UG/L AS F

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	Before '74
LIS Test Name Code:	FFIDUR	Units	: mg/L as F
Work Station Code	: WFN03 or WFF	Unit Code	: 064809
Method Code	: 003AC2	Supervisor	: M. Rawlings
Sample Type/Matrix:	Domestic Waters, Surface Waters, Leachates, Effluents		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Using an automated flow system the sample is distilled in the presence of sulphuric acid at 160 C; the distillate is then reacted (in an acetic acid-acetate buffer media) with Alizarin Blue and lanthanum nitrate to form a ternary Alizarin Blue-lanthanide-fluoride complex.
Approximate absorbance is 0.6 at the 2.0 mg/L level

INSTRUMENTATION:

Modular continuous flow colourimetric system plus a distillation module.
Colourimetric measurement is through a 5.0 cm light path at 630 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.03

CALIBRATION:

BL plus 1 standard in duplicate

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL plus 2 standards

FLUORIDE
QUALITY CONTROL DATA FROM 02/01/85 TO 27/12/85

Lab: Domestic Water

Analytical Range: 0.03 to 2.00 mg/L as F

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	92	1.50	1.48	-0.02	0.028
b :	92	0.30	0.31	0.01	0.013
a+b :	92	1.80	1.78	-0.02	0.034
a-b :	92	1.20	1.17	-0.03	0.027

s.d.(AB): Sw(within run): 0.019 S(between runs): 0.022 S/Sw: 1.14

On any given day the calibration is accepted if the values obtained lie within the ranges:

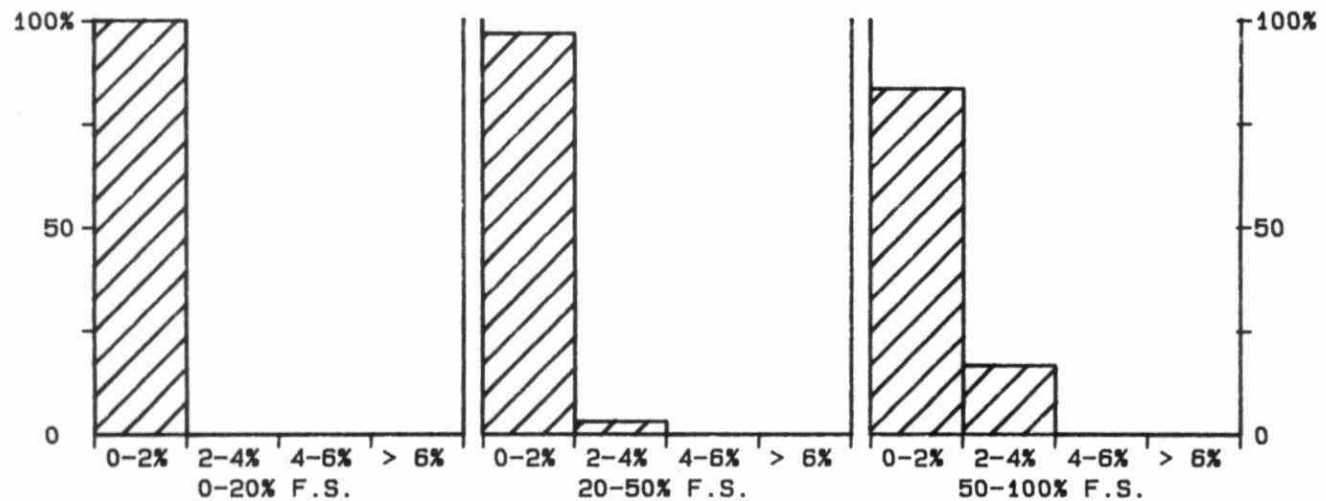
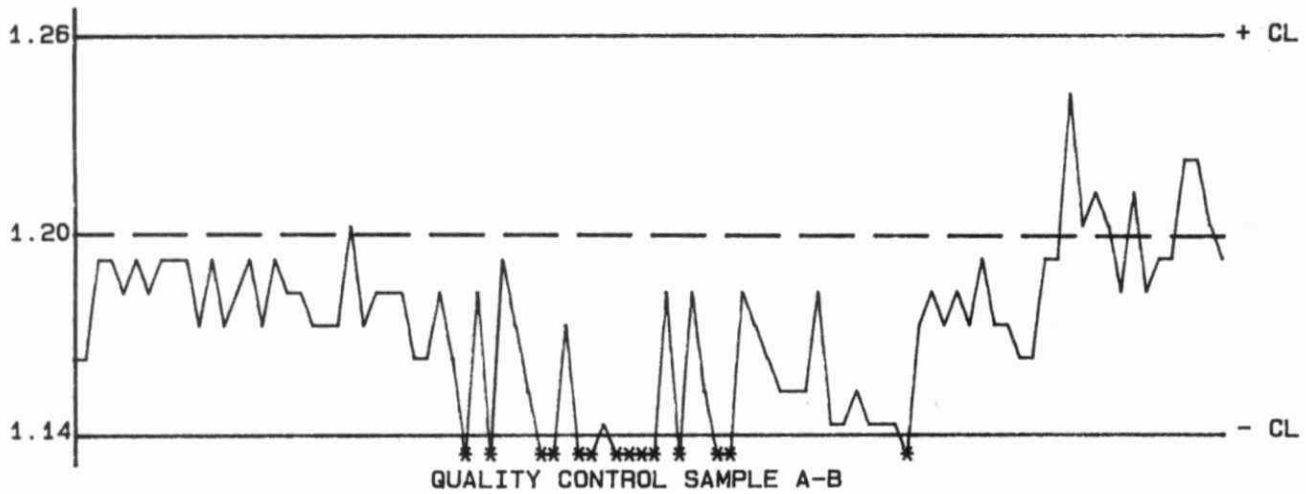
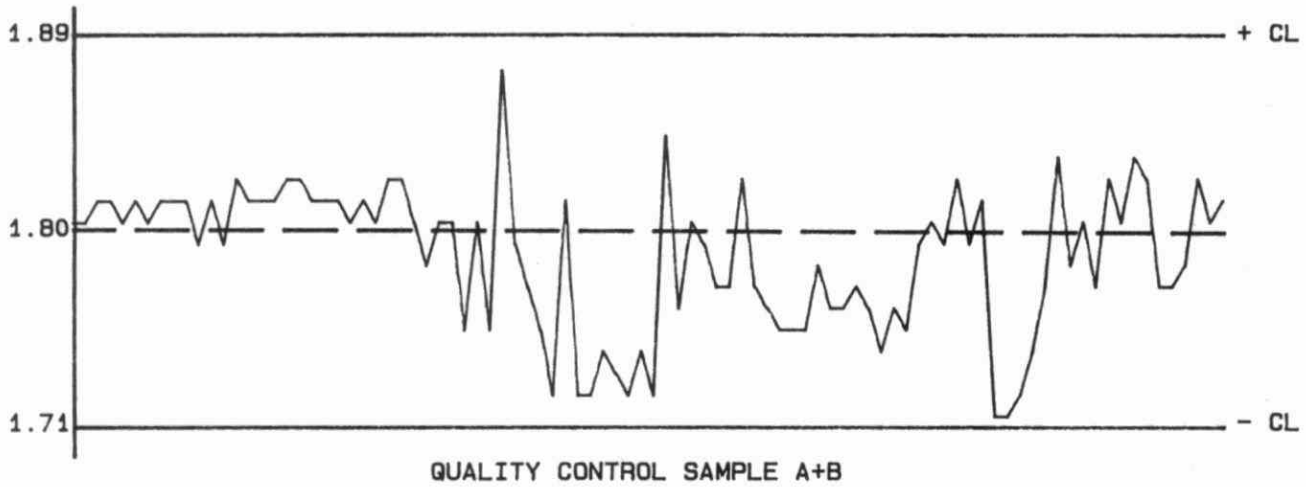
1.71 to 1.89 for A+B
 1.14 to 1.26 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	174	0.00 - 0.20	0.009	10.6
	40	0.20 - 0.50	0.010	3.3
	24	0.50 - 1.00	0.011	1.3
	17	1.00 - 2.00	0.019	1.5
	255	Overall	0.010	N/A

DETECTION CRITERION: 0.03

QUALITY CONTROL GRAPHS FLUORIDE (MG/L AS F)

FROM: 02/01/85
TO: 27/12/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS F

*** IRON - TOTAL ***

IDENTIFICATION:

Laboratory : Domestic Water Method Introduced: 20/04/76
 LIS Test Name Code: FEUT Units : mg/L as Fe
 Work Station Code : WFEMN Unit Code : 064826
 Method Code : 504BC2 Supervisor : M. Rawlings
 Sample Type/Matrix: Domestic Waters, Leachates, Sewage, Industrial Waste, Effluents

SAMPLING:

Quantity Required: 100 mL
 Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples (25.0 mL) are autoclaved in sulphuric acid-hydroxylamine media at 121 C for 45 min. The iron content of the digestate is determined colourimetrically by formation of the ferrous-2,4,6-Tri(2'pyridyl)-1,3,5-triazine (TPTZ) complex in a buffered system.

Approximate absorbance : 0.5 at the 2.0 mg/L level.

N.B. Manganese is determined simultaneously.

INSTRUMENTATION:

Autoclave plus basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.01

Detection Criterion (T): 0.02

CALIBRATION:

BL plus 1 undigested standard

CONTROLS:

Calibration : LTBL plus 2 undigested standards, eg, QCA
 Recovery : Digested BL plus 2 digested standards, eg, R1
 Drift : BL plus 1 undigested standard

NOTES:

Calibration standards are prepared from a hydrate: $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$.
 Results are corrected using a digested blank value.

01/07/85 Test transferred to I.T.C. No data summary is available for period not covered in performance report.

IRON-TOTAL
QUALITY CONTROL DATA FROM 02/01/85 TO 28/06/85

Lab: Domestic Water

Analytical Range: 0.02 to 2.00 mg/L as Fe

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	59	1.40	1.41	0.01	0.014
b :	59	0.28	0.30	0.02	0.013
a+b :	59	1.68	1.71	0.03	0.023
a-b :	59	1.12	1.11	-0.01	0.015

s.d.(AB): Sw(within run): 0.011 S(between runs): 0.014 S/Sw: 1.27

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.59 to 1.77 for A+B
 1.06 to 1.18 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	59	1.40	1.40	0.046
r2 :	59	0.28	0.30	0.010

DUPLICATES:

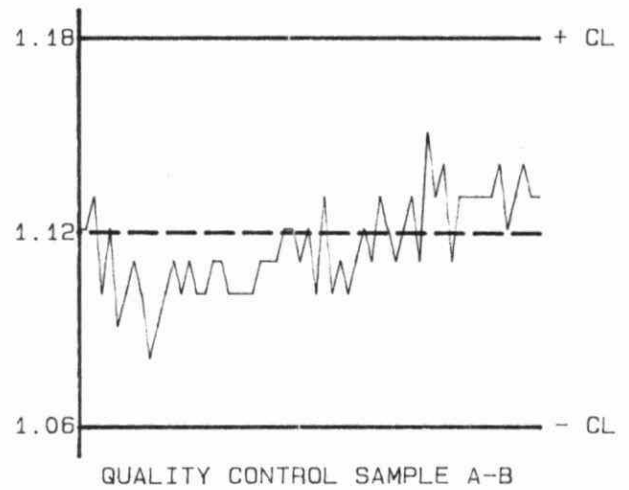
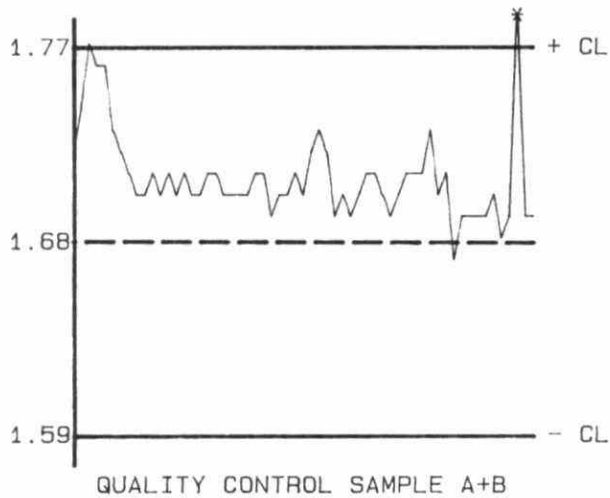
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
82	0.00 - 0.20	0.007	9.2
38	0.20 - 0.50	0.013	3.9
31	0.50 - 1.00	0.016	2.4
10	1.00 - 2.00	0.017	1.1
161	Overall	0.011	N/A

DETECTION CRITERION: 0.02**OTHER CHECKS:**

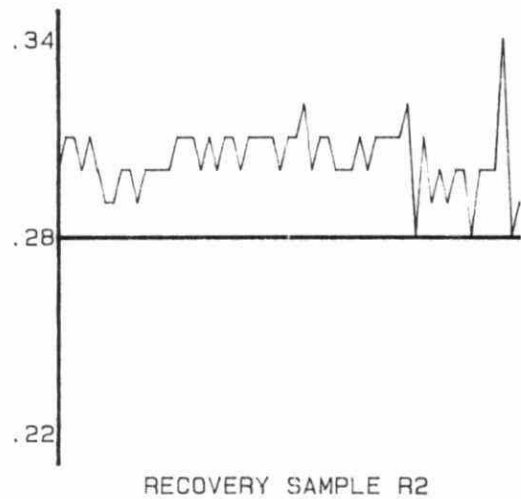
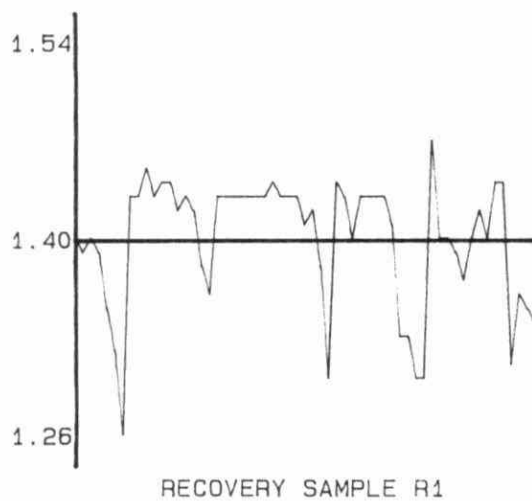
	Number of Data	Data Mean	Standard(1) Deviation
Digested Blank :	59	0.01	0.006

QUALITY CONTROL GRAPHS IRON-TOTAL (MG/L AS FE)

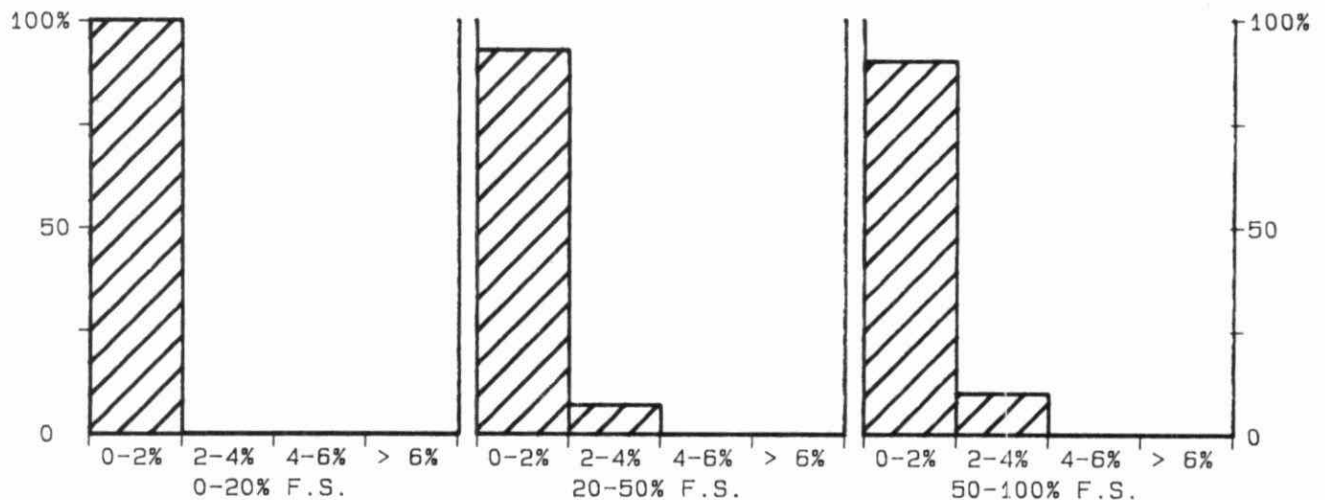
FROM: 02/01/85
TO: 28/06/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS FE

*** MAGNESIUM ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/07/82
LIS Test Name Code:	MBUR	Units	: mg/L as Mg
Work Station Code	: WCAMGH	Unit Code	: 064812
Method Code	: 001AA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Effluents			

SAMPLING:

Quantity Required: 100 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm using an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.15 at the 20 mg/L level

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS). Two analytical ranges are obtained from the output of the AAS.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.05	Detection Criterion (T): 0.3

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : BL plus 3 standards

MODIFICATIONS:

01/07/82- The method introduced on this date differed slightly from Method B for magnesium in HAMES in that full scale was 20.0 mg/L; concentrations of QC standards were also adjusted.

MAGNESIUM
QUALITY CONTROL DATA FROM 02/01/85 TO 30/12/85

Lab: Domestic Water

Analytical Range: 0.3 to 80.0 mg/L as Mg

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	133	52.0	52.1	0.1	0.73
b :	133	13.0	13.4	0.4	0.35
a+b :	133	65.0	65.5	0.5	0.83
a-b :	133	39.0	38.8	-0.2	0.78
c :	133	13.0	13.2	0.2	0.22
d :	133	2.6	2.6	-0.0	0.09
c+d :	133	15.6	15.7	0.1	0.27
c-d :	133	10.4	10.6	0.2	0.20

s.d.(AB): Sw(within run): 0.55 S(between runs): 0.57 S/Sw: 1.04
 s.d.(CD): Sw(within run): 0.14 S(between runs): 0.17 S/Sw: 1.19

On any given day the calibration is accepted if the values obtained lie within the ranges:

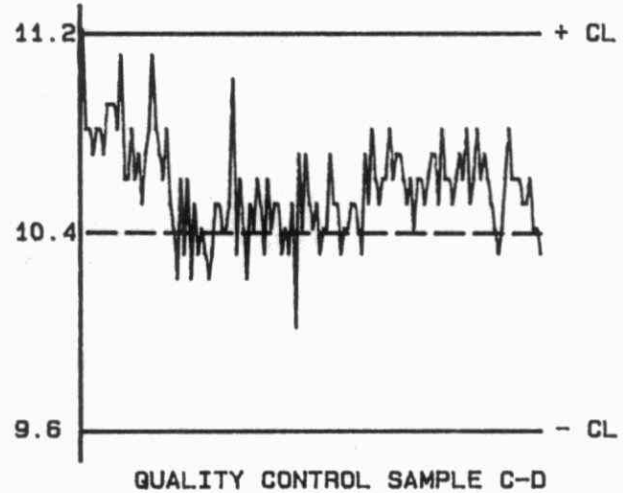
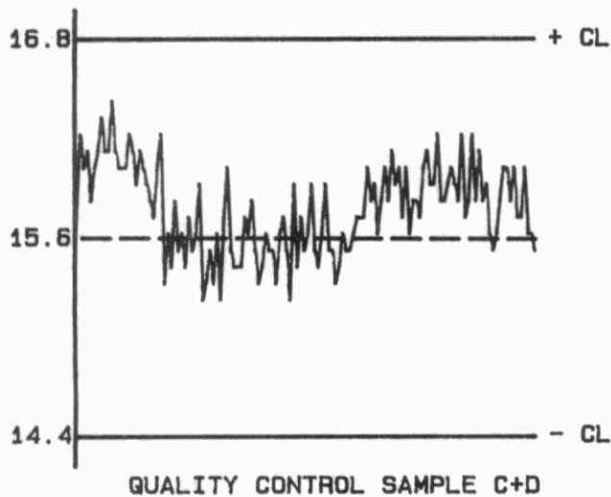
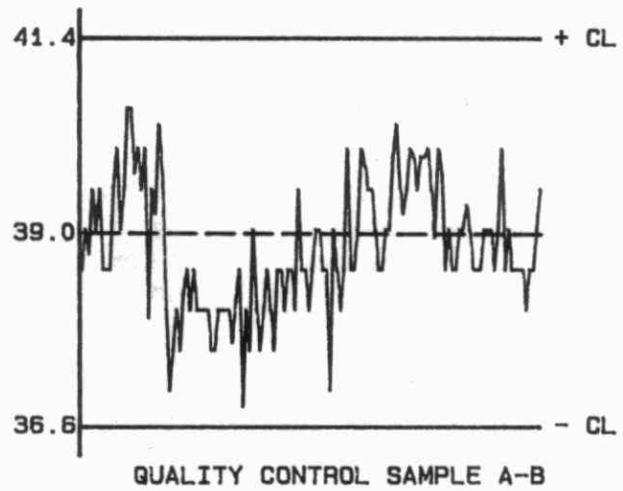
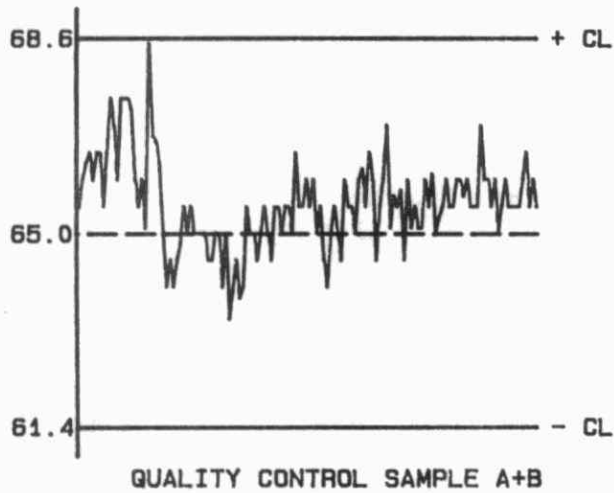
61.4 to 68.6 for A+B
 36.6 to 41.4 for A-B
 14.4 to 16.8 for C+D
 9.6 to 11.2 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	69	0.0 - 4.0	0.11	5.4
	105	4.0 - 10.0	0.13	1.8
	85	10.0 - 20.0	0.24	1.5
	91	20.0 - 40.0	0.38	1.4
	14	40.0 - 80.0	1.01	2.1
	364	Overall	0.31	N/A

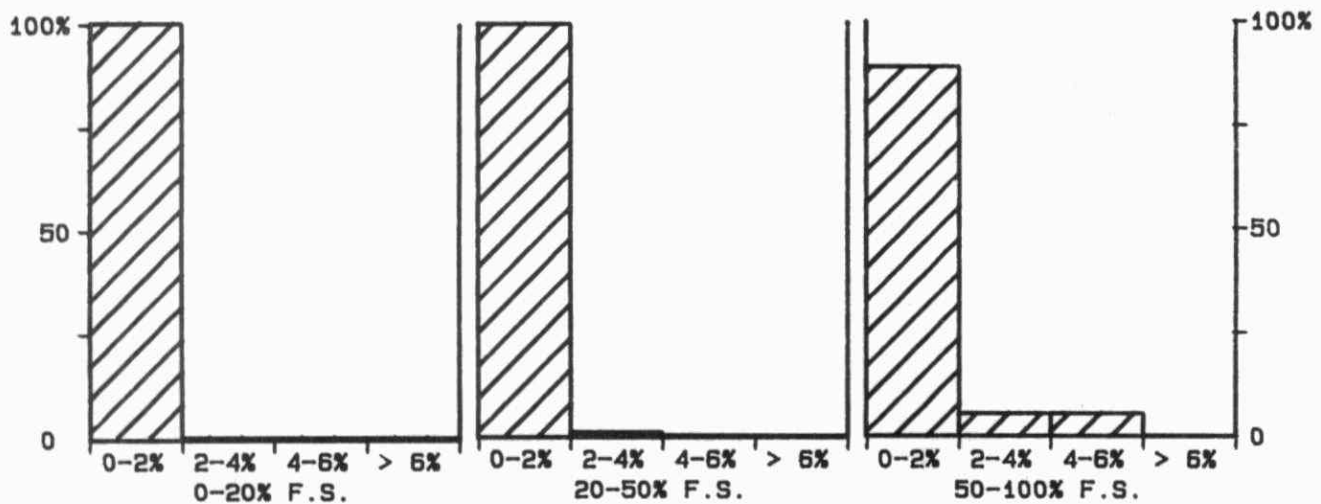
DETECTION CRITERION: 0.3

QUALITY CONTROL GRAPHS MAGNESIUM (MG/L AS MG)

FROM: 02/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



*** MAGNESIUM ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	18/05/79
LIS Test Name Code:	MGUR	Units	: mg/L as Mg
Work Station Code	: PRAA	Unit Code	: 064812
Method Code	: 001CA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow.			

SAMPLING:

Quantity Required: 5 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Samples are analysed by AAS at 285.2 nm with an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.5 at the 0.50 mg/L level.

INSTRUMENTATION:

Automated modular flow injection atomic absorption spectrophotometer(AAS) system

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.005

Detection Criterion (T): 0.012

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL every 10 samples, 2 standards every 20 samples.

MODIFICATIONS:

- 17/05/85 - Three additional calibration standards were set up.
- Flow injection introduction of sample was adopted.
- System further automated with the addition of a microcomputer to co-ordinate sampler, injection, AAS "read", and data reduction.
- Sample required reduced to 5 mL.

MAGNESIUM
QUALITY CONTROL DATA FROM 09/01/85 TO 20/12/85

Lab: Precipitation

Analytical Range: 0.012 to 0.500 mg/L as Mg

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	68	0.300	0.299	-0.001	0.0079
b :	69	0.050	0.049	-0.001	0.0046
a+b :	68	0.350	0.349	-0.001	0.0091
a-b :	68	0.250	0.250	0.000	0.0092

s.d.(AB): SW(within run): 0.0065 S(between runs): 0.0065 S/SW: 0.99

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.320 to 0.380 for A+B
 0.230 to 0.270 for A-B

DUPLICATES:

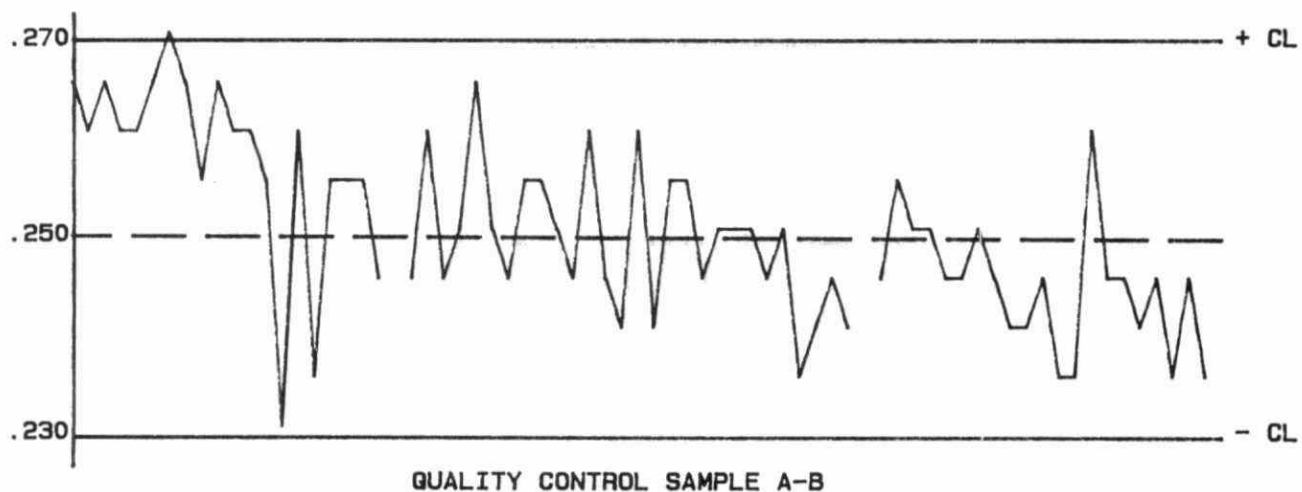
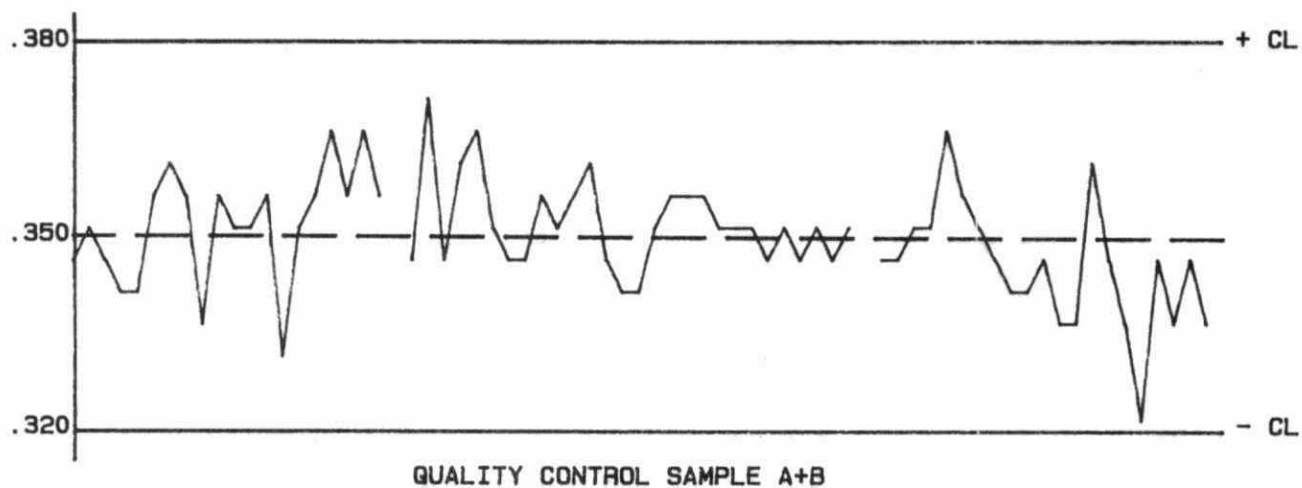
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
91	0.000 - 0.050	0.0041	16.9
35	0.050 - 0.100	0.0050	6.9
25	0.100 - 0.250	0.0098	6.3
15	0.250 - 0.500	0.0071	2.0
166	Overall	0.0058	N/A

DETECTION CRITERION: 0.012

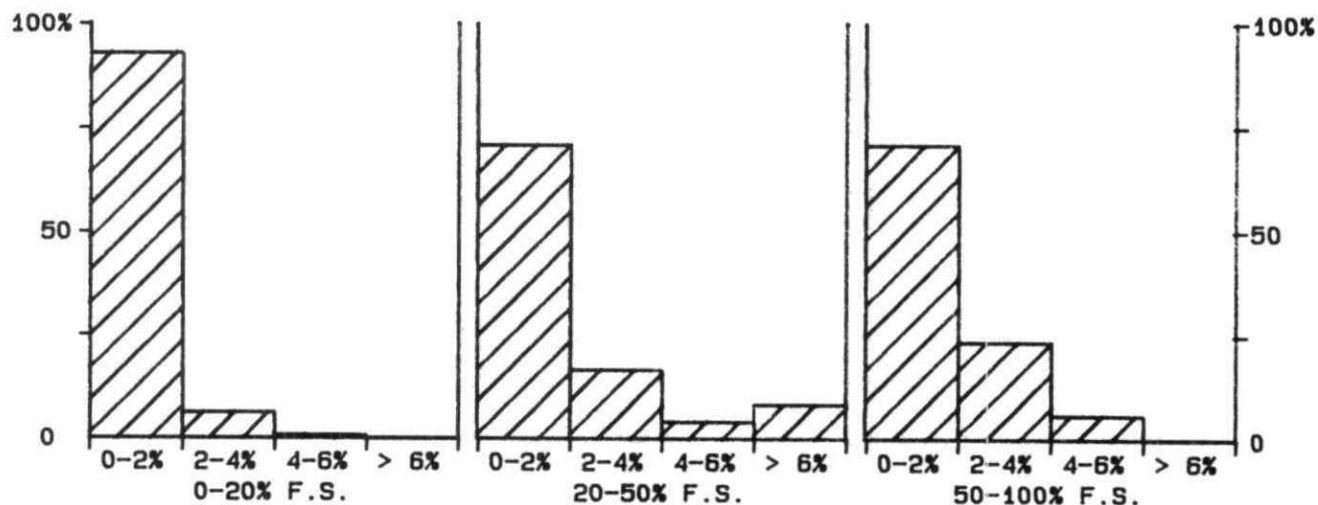
QUALITY CONTROL GRAPHS MAGNESIUM (MG/L AS MG)

FROM: 09/01/85

TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): .5 MG/L AS MG

*** MAGNESIUM ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/74
LIS Test Name Code: MGUR Units : mg/L as Mg
Work Station Code : RMAAS Unit Code : 064812
Method Code : 001AA1,001BA1 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Soil Extracts, Effluents.

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm using an air-acetylene flame. Acidified lanthanum chloride is added as a releasing agent via an automated sampling train.
Approximate absorbance: RMAAS: 1.25

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS).

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.05,0.06,0.11

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA for each analytical range
Drift : BL plus 1 standard

MODIFICATIONS:

01/12/81- Calibration range became 5.00 mg/L full scale; second analytical range was dropped.
01/03/84- Analytical range(RMCAMGL) was added; full scale:1.00 mg/L. This range is currently restricted to special programs.
01/09/84- Analytical range(RMCAMGH) was increased from 5.00 to 10.0 mg/L full scale. Calibration technique was changed from quadratric to linear interpolation. Calcium is no longer determined simultaneously.
25/09/85- Calibration range became 7.0 mg/L full scale; second analytical range was dropped. Microcomputer controlled system.

NOTES:

Three analytical ranges were used during 1985: 1.00, 7.00, and 10.0 mg/L as Mg full scale. Detection criteria above apply to these ranges respectively.
*T value is based on duplicate analyses at concentrations above the lowest range.

MAGNESIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 09/09/85

Lab: Rivers and Lakes

Analytical Range: 0.11 to 10.00 mg/L as Mg

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	37	7.50	7.55	0.05	0.136
b :	37	2.50	2.52	0.02	0.078
a+b :	37	10.00	10.07	0.07	0.177
a-b :	37	5.00	5.02	0.02	0.133

s.d.(AB): Sw(within run): 0.094 S(between runs): 0.111 S/Sw: 1.18

On any given day the calibration is accepted if the values obtained lie within the ranges:

9.55 to 10.45 for A+B
 4.70 to 5.30 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	18	0.00 - 0.50	0.038	10.2
	23	0.50 - 1.00	0.101	13.9
	16	1.00 - 2.50	0.077	4.8
	21	2.50 - 5.00	0.380	10.0
	10	5.00 - 10.00	0.226	3.1
	88	Overall	0.210	N/A

DETECTION CRITERION: 0.11

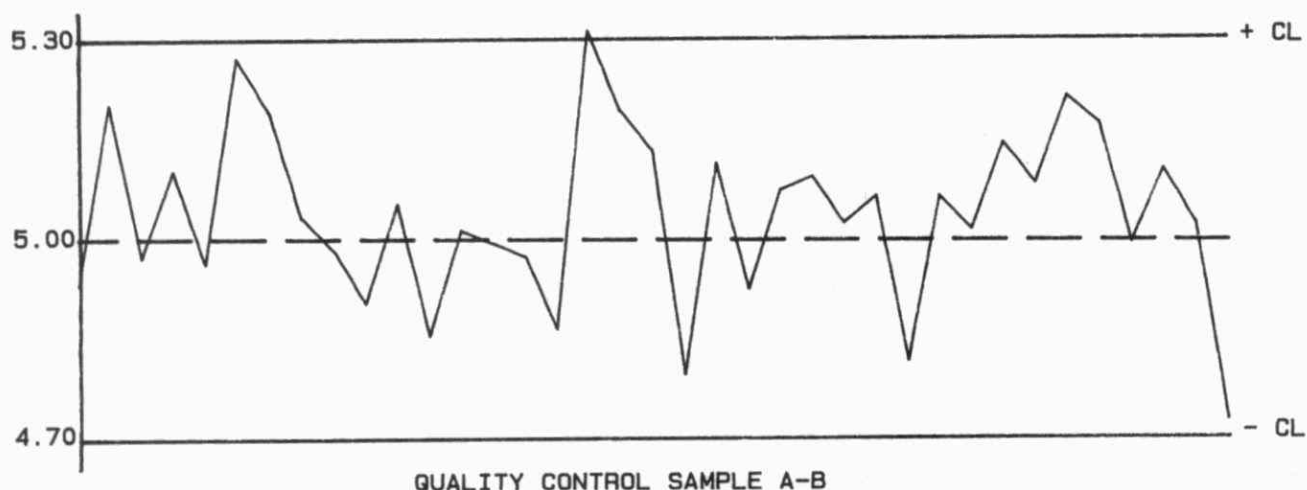
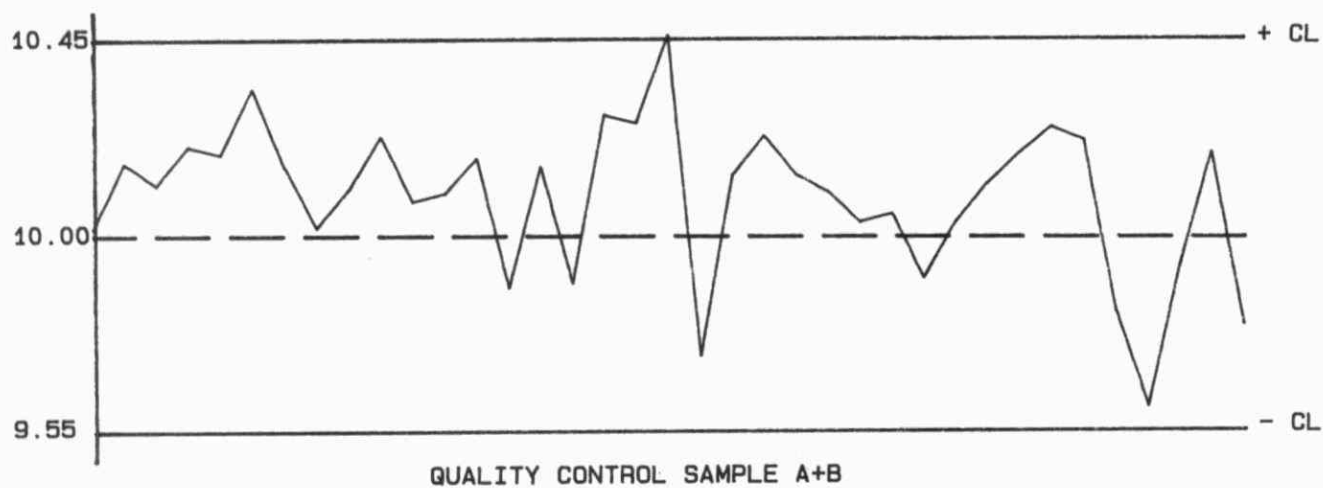
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	27	1.03	0.114
Long Term Blank :	0	N/A	N/A

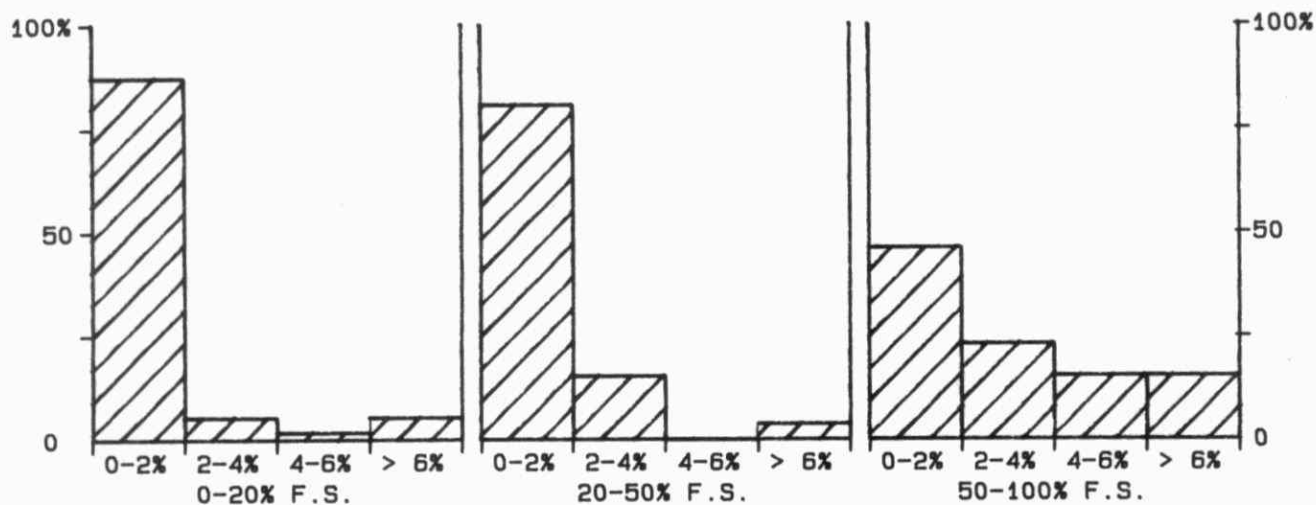
QUALITY CONTROL GRAPHS MAGNESIUM (MG/L AS MG)

FROM: 03/01/85

TO: 09/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 10 MG/L AS MG

MAGNESIUM
QUALITY CONTROL DATA FROM 02/10/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.06 to 7.00 mg/L as Mg

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	25	5.60	5.61	0.01	0.082
b :	25	0.49	0.49	0.00	0.013
a+b :	25	6.09	6.10	0.01	0.084
a-b :	25	5.11	5.12	0.01	0.082

s.d.(AB): Sw(within run): 0.058 S(between runs): 0.059 S/Sw: 1.01

On any given day the calibration is accepted if the values obtained lie within the ranges:

5.77 to 6.40 for A+B
 4.90 to 5.32 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	3	0.00 - 0.35	0.021	6.1
	34	0.35 - 0.70	0.032	6.0
	20	0.70 - 1.40	0.032	3.6
	9	1.40 - 3.50	0.071	3.3
	7	3.50 - 7.00	0.402	8.0
	73	Overall	0.130	N/A

DETECTION CRITERION: 0.06

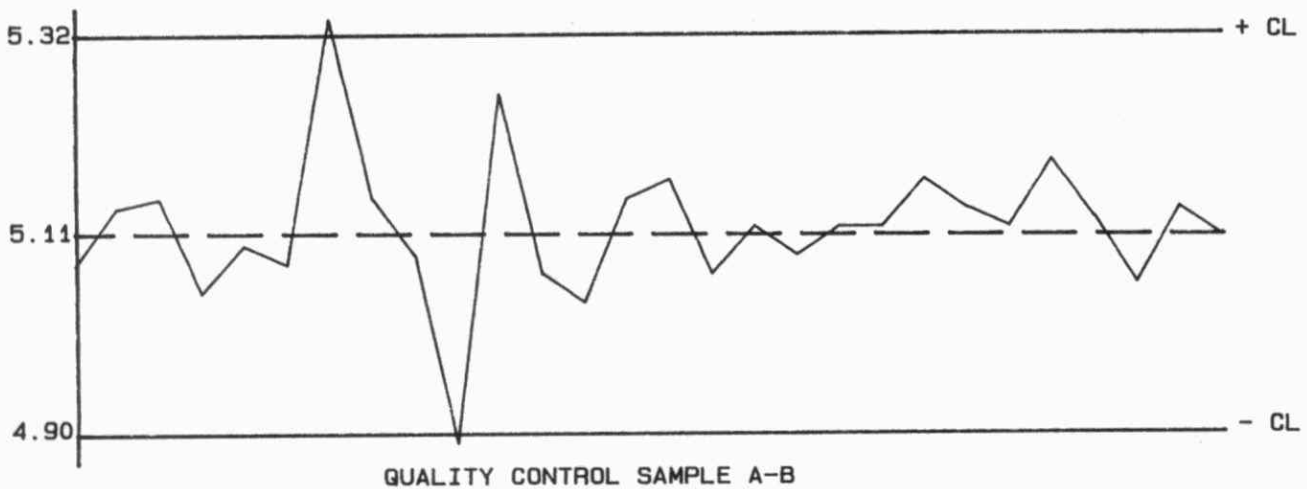
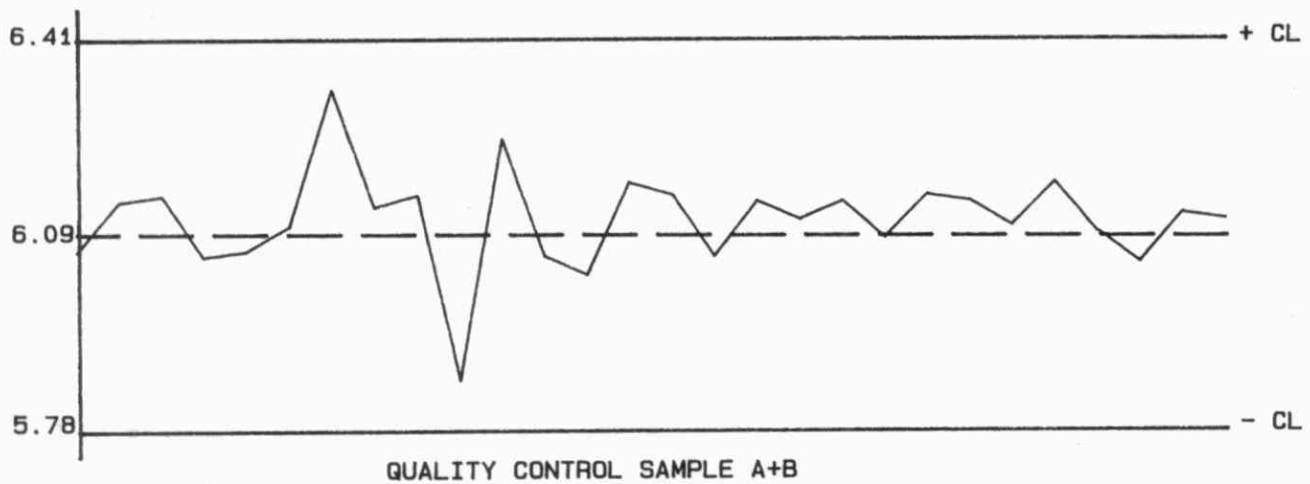
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	0	N/A	N/A
Long Term Blank :	0	N/A	N/A

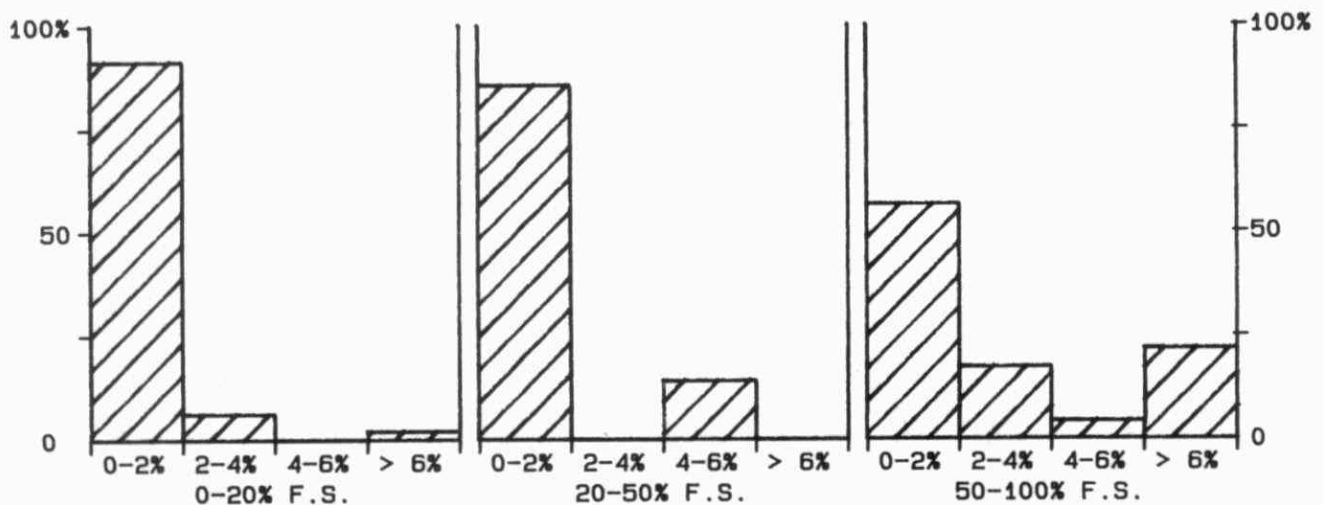
QUALITY CONTROL GRAPHS MAGNESIUM (MG/L AS MG)

FROM: 25/09/85

TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 7 MG/L AS MG

MAGNESIUM
QUALITY CONTROL DATA FROM 08/01/85 TO 10/09/85

Lab: Rivers and Lakes

Analytical Range: N/A to 1.00 mg/L as Mg

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	41	0.75	0.75	0.00	0.013
b :	41	0.25	0.25	-0.00	0.008
a+b :	41	1.00	1.00	0.00	0.015
a-b :	41	0.50	0.50	0.00	0.015

s.d.(AB): Sw(within run): 0.011 S(between runs): 0.011 S/Sw: 1.02

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.95 to 1.05 for A+B
 0.47 to 0.53 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	1	0.00 - 0.20	N/A	N/A
	17	0.20 - 0.50	0.018	4.6
	76	0.50 - 1.00	0.031	4.3
	94	Overall	0.029	N/A

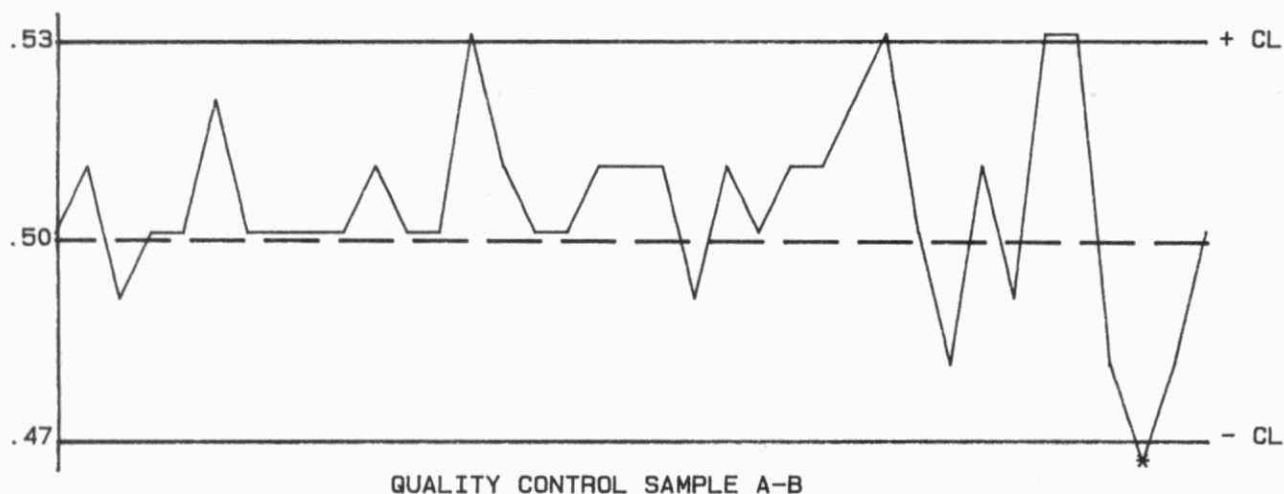
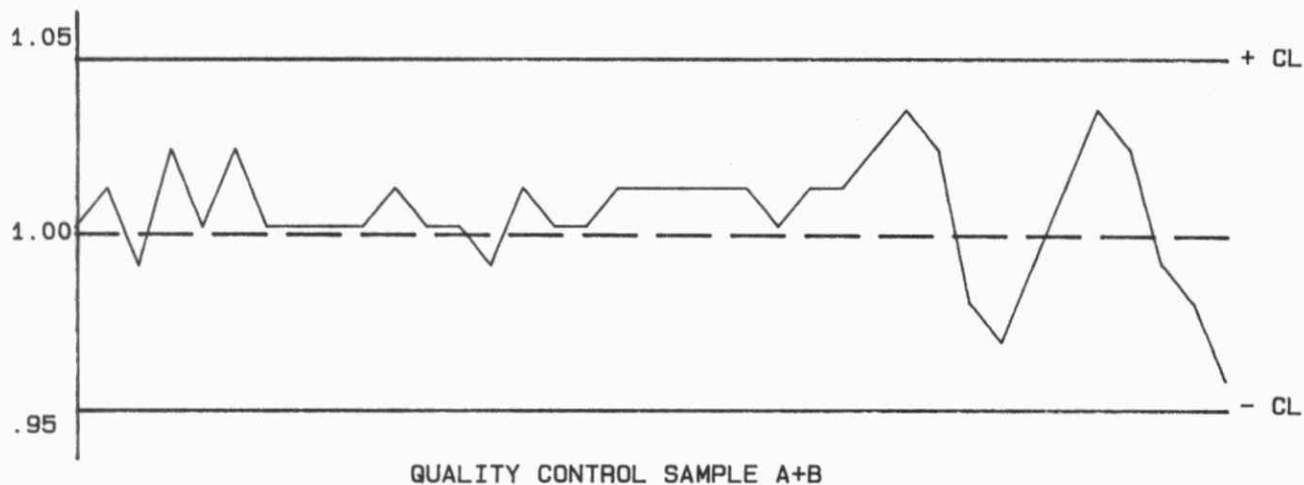
DETECTION CRITERION: N/A

OTHER CHECKS:

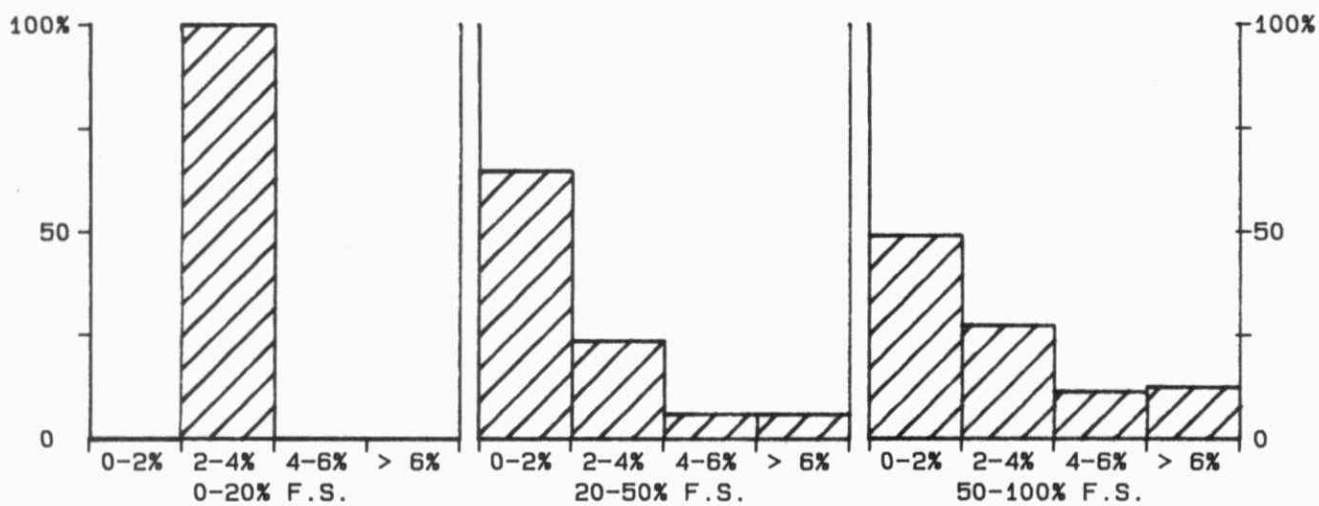
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	37	1.03	0.199
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS MAGNESIUM (MG/L AS MG)

FROM: 08/01/85
TO: 10/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1 MG/L AS MG

*** MANGANESE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/05/83
LIS Test Name Code:	MNUT	Units	: mg/L as Mn
Work Station Code	: WFEMN	Unit Code	: 064825
Method Code	: 504BC2	Supervisor	: M. Rawlings
Sample Type/Matrix:	Domestic Waters, Sewage, Leachates, Effluents		

SAMPLING:

Quantity Required: 100 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples (25.0 mL) are autoclaved in sulphuric acid-hydroxylamine media at 121 C for 45 min. The manganese content of the digestate is determined colourimetrically by formation of the manganese-formaldehyde complex in a buffered system; this system is designed to suppress interferences from cations such as iron. A reference stream, based on an inverted order of reagent addition, is also required for suppression of cation interference.

Approximate absorbance : 0.3 at the 0.5 mg/L level.

N.B. Iron is determined simultaneously.

INSTRUMENTATION:

-Autoclave plus basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 480 nm.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.002

Detection Criterion (T): 0.007

CALIBRATION:

BL plus 1 undigested standard

CONTROLS:

Calibration : LTBL plus 2 undigested standards, eg, QCA

Recovery : Digested BL plus 2 digested standards, eg, R1

Drift : BL plus 1 undigested standard

Interference: Iron standard confirms suppression of cation interference.

MODIFICATIONS:

01/05/83- The method introduced on this date differed from Method A for manganese in HAMES in that full scale was 0.5 mg/L. Concentrations of QC standards were also adjusted.

NOTES:

Calibration standards are prepared from a hydrate: $MnCl_2 \cdot 4H_2O$

Results are corrected using a digested blank value.

01/07/85 Test transferred to I.T.C. No data summary is available for period not covered in performance report.

MANGANESE
QUALITY CONTROL DATA FROM 02/01/85 TO 28/06/85

Lab: Domestic Water

Analytical Range: 0.007 to 0.500 mg/L as Mn

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	57	0.350	0.350	0.000	0.0020
b :	57	0.070	0.070	0.000	0.0016
a+b :	57	0.420	0.421	0.001	0.0026
a-b :	57	0.280	0.280	-0.000	0.0025

s.d.(AB): Sw(within run): 0.0018 S(between runs): 0.0018 S/Sw: 1.02

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.390 to 0.450 for A+B
 0.260 to 0.300 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	57	0.350	0.352	0.0060
r2 :	57	0.070	0.072	0.0019

DUPLICATES:

	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
113		0.000 - 0.050	0.0023	13.3
18		0.050 - 0.100	0.0031	4.5
17		0.100 - 0.250	0.0076	4.6
4		0.250 - 0.500	0.0040	1.2
152		Overall	0.0034	N/A

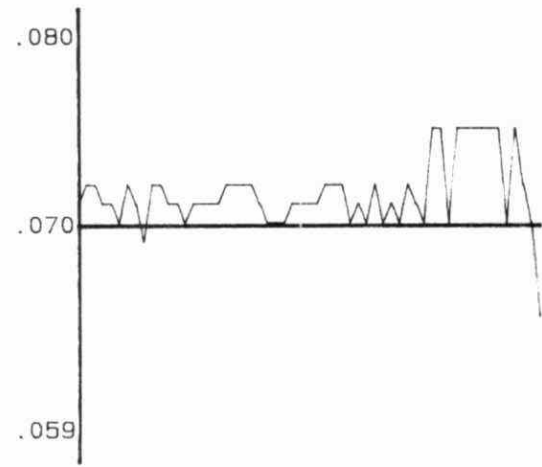
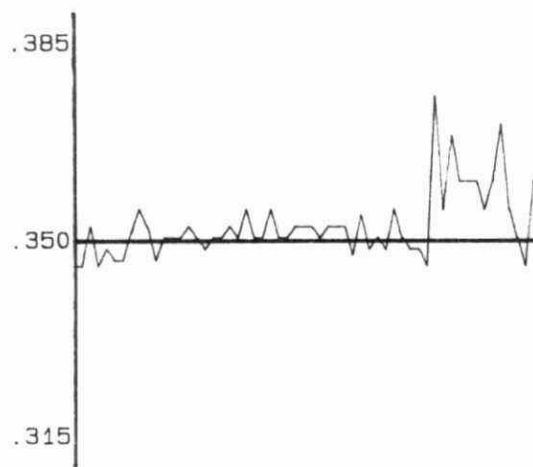
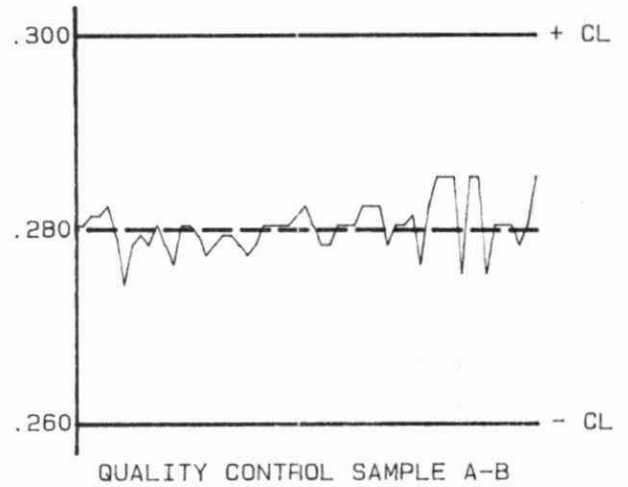
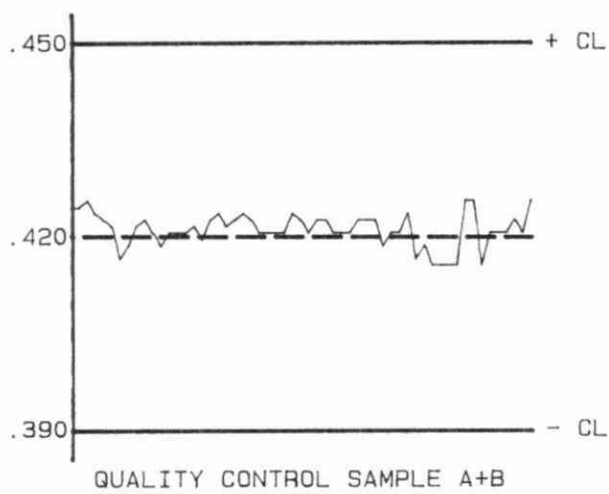
DETECTION CRITERION: 0.007

OTHER CHECKS:

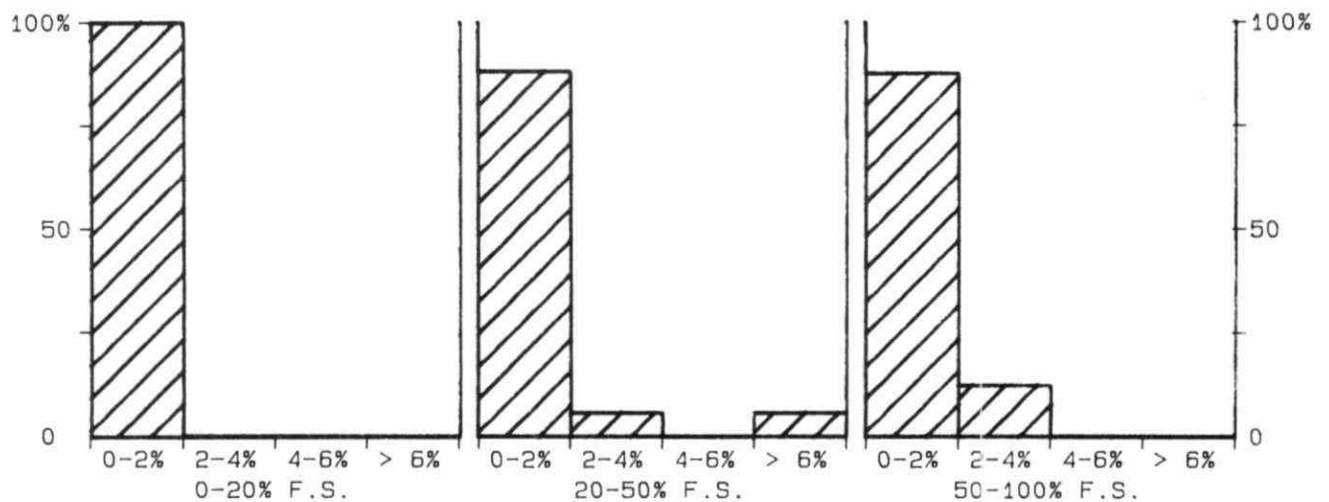
	Number of Data	Data Mean	Standard(1) Deviation
Digested Blank :	57	0.003	0.0016

QUALITY CONTROL GRAPHS MANGANESE (MG/L AS MN)

FROM: 02/01/85
TO: 28/06/85



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): .5 MG/L AS MN

*** NITROGEN-AMMONIA PLUS AMMONIUM ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 01/06/76
Supervisor : F. Tomassini Units : ug/L as N
Sample Type/Matrix: Streams, Lakes, Precipitation

SAMPLING:

Quantity Required: 50 mL
Container : Plastic (polystyrene)

SAMPLE PREPARATION:

Samples are filtered through 0.45u membrane filters.

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the filtrate via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 0.40 at the 1000ug/L as N level.

N.B. Nitrate plus nitrite is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37 C heating bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 1

Detection Criterion (T): 3.5

CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration : LTBL plus 4 standards, eg, QCA

Drift : BL plus 1 standard

NITROGEN - AMMONIA + AMMONIUM
QUALITY CONTROL DATA FROM 10/01/85 TO 19/12/85

Lab: Dorset

Analytical Range: 3.5 to 1000 ug/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	48	750	752	2	6.0
b :	48	250	249	-1	5.3
a+b :	48	1000	1001	1	9.1
a-b :	48	500	503	3	6.7
c :	48	75.0	75.2	0.2	1.02
d :	48	25.0	25.0	0.0	0.97
c+d :	48	100.0	100.1	0.1	1.60
c-d :	48	50.0	50.2	0.2	1.19

s.d.(AB): SW(within run): 4.7 S(between runs): 5.7 S/SW: 1.19
 s.d.(CD): SW(within run): 0.84 S(between runs): 1.00 S/SW: 1.18

On any given day the calibration is accepted if the values obtained lie within the ranges:

970 to 1030 for A+B
 480 to 520 for A-B
 88.0 to 112.0 for C+D
 42.0 to 58.0 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	78	0.0 - 25.0	1.17	14.0
	15	25.0 - 50.0	0.89	2.6
	10	50.0 - 100.0	2.41	3.6
	8	100 - 500	10.2	6.0
	1	500 - 1000	N/A	N/A
	112	Overall	3.1	N/A

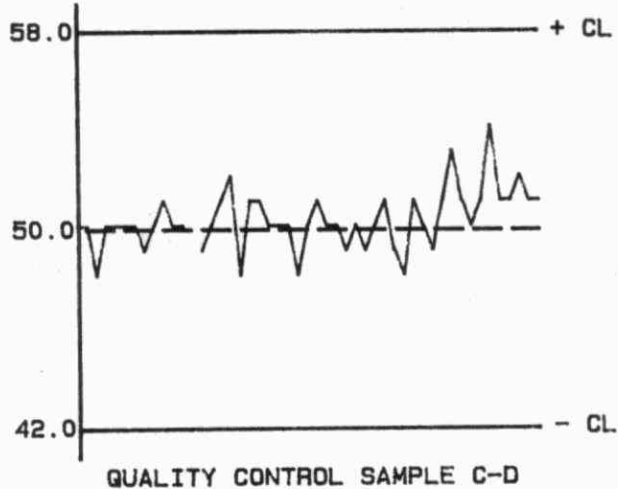
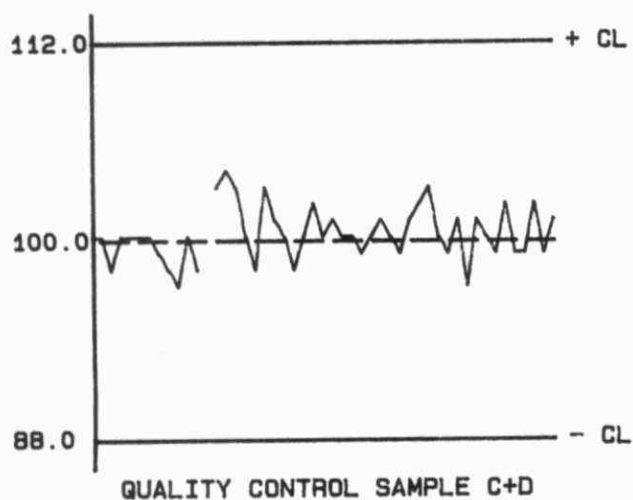
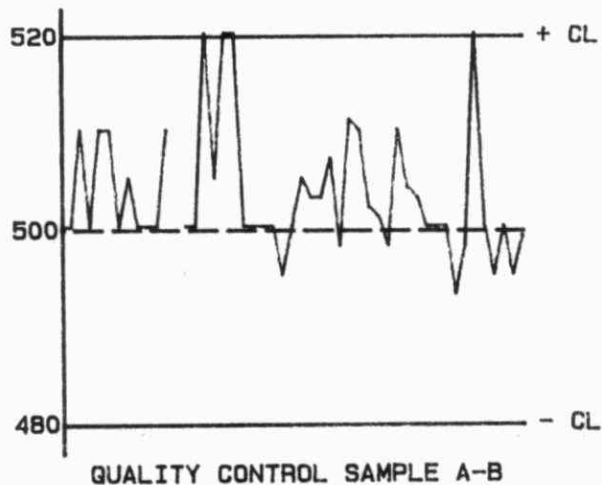
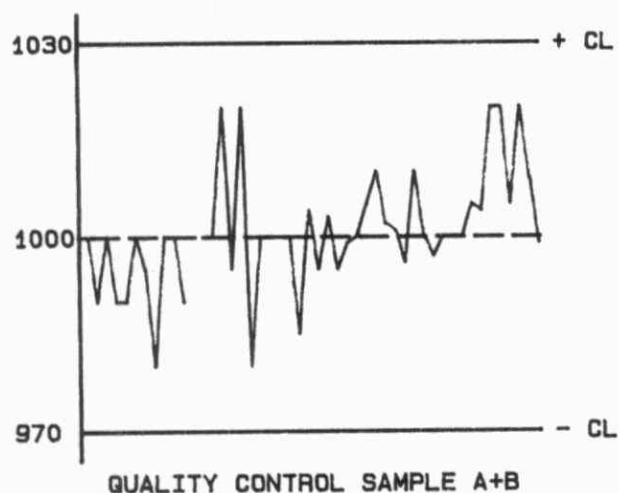
DETECTION CRITERION: 3.5**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
STD. CAL. :	48	292	67.2
Long Term Blank :	48	0.6	0.79

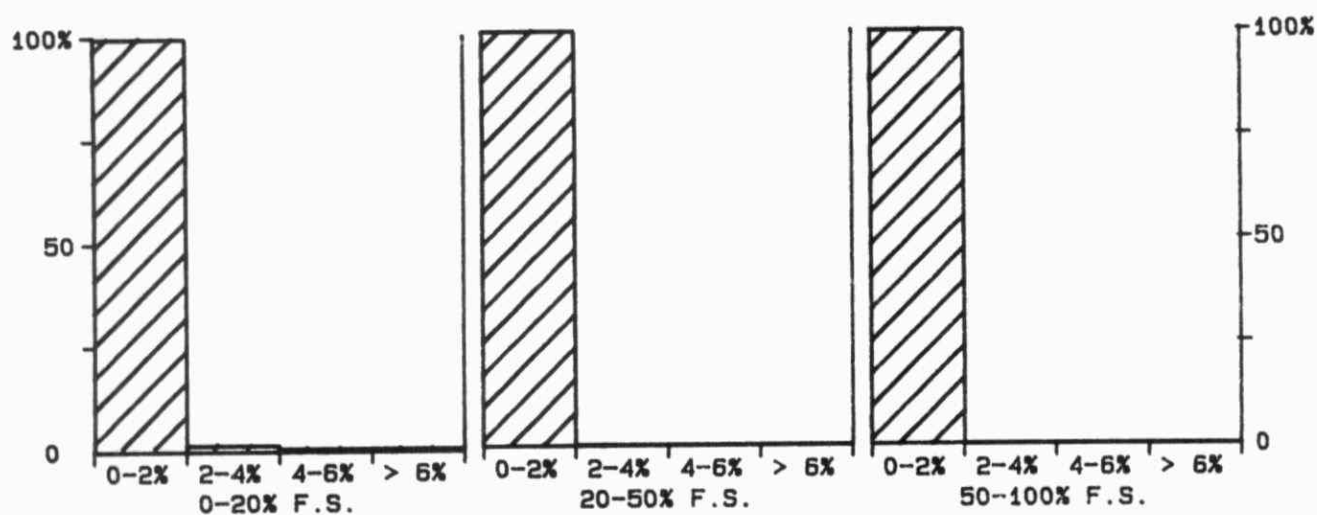
QUALITY CONTROL GRAPHS NITROGEN - AMMONIA + AMMONIUM (UG/L AS N)

FROM: 10/01/85

TO: 19/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1000 UG/L AS N

*** NITROGEN - AMMONIA PLUS AMMONIUM ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/05/84
LIS Test Name Code:	NNHTFR, NNHTUR	Units	: mg/L as N
Work Station Code	: PRNUT	Unit Code	: 064807
Method Code	: 103CC2	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow			

SAMPLING:

Quantity Required: 5 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 1.1 at 5.00 mg/L as N level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37 C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm light path at 630 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.005

Detection Criterion (T): 0.014

CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : BL plus 3 standards every 10 samples

MODIFICATIONS:

01/05/84- The procedure introduced on this date is the same as Method A for nitrogen-ammonia in HAMES except that the samples are not filtered and the full scale concentration is 5.00 mg/L as N.

NITROGEN - AMMONIA PLUS AMMONIUM
QUALITY CONTROL DATA FROM 04/01/85 TO 18/12/85

Lab: Precipitation

Analytical Range: 0.012 to 5.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	95	4.00	4.00	-0.00	0.026
b :	95	0.80	0.81	0.01	0.013
a+b :	95	4.80	4.80	0.00	0.032
a-b :	95	3.20	3.19	-0.01	0.025
c :	95	0.800	0.803	0.003	0.0054
d :	95	0.200	0.192	-0.008	0.0045
c+d :	95	1.000	0.995	-0.005	0.0074
c-d :	95	0.600	0.612	0.012	0.0066

s.d.(AB): Sw(within run): 0.018 S(between runs): 0.021 S/Sw: 1.16
s.d.(CD): Sw(within run): 0.0047 S(between runs): 0.0050 S/Sw: 1.07

On any given day the calibration is accepted if the values obtained lie within the ranges:

4.69 to 4.91 for A+B
3.13 to 3.28 for A-B
0.940 to 1.060 for C+D
0.560 to 0.640 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	70	0.000 - 0.100	0.0039	11.7
	146	0.100 - 0.500	0.0031	1.2
	33	0.500 - 1.000	0.0077	1.1
	23	1.00 - 5.00	0.020	0.9
	272	Overall	0.007	N/A

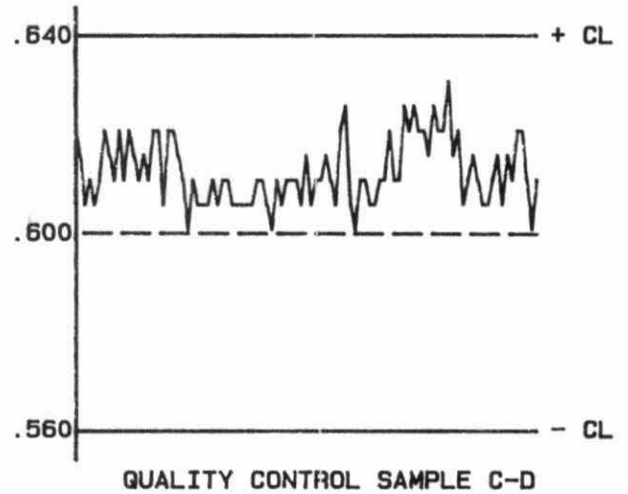
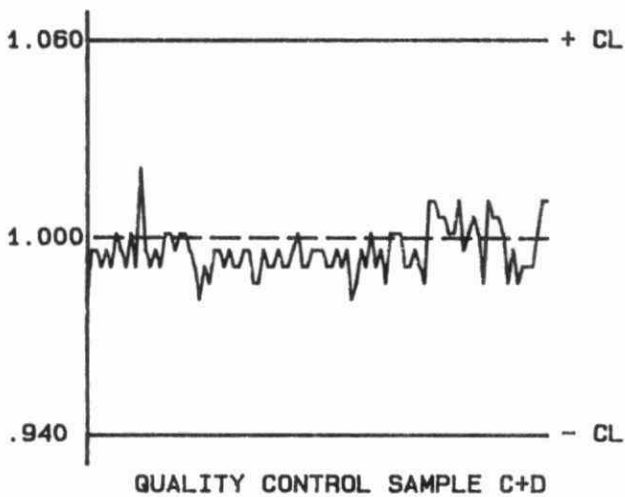
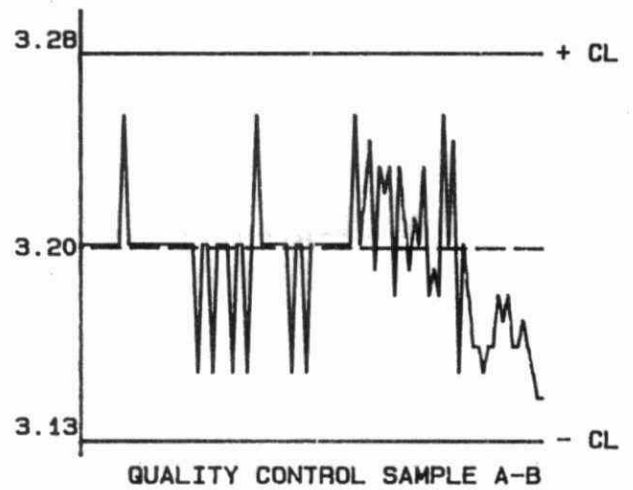
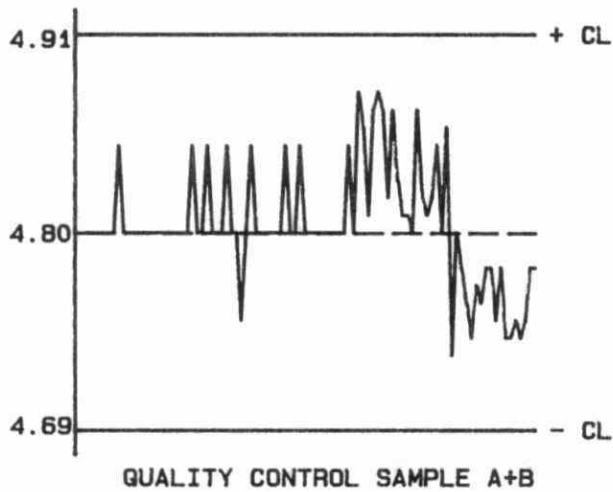
DETECTION CRITERION: 0.012

OTHER CHECKS:

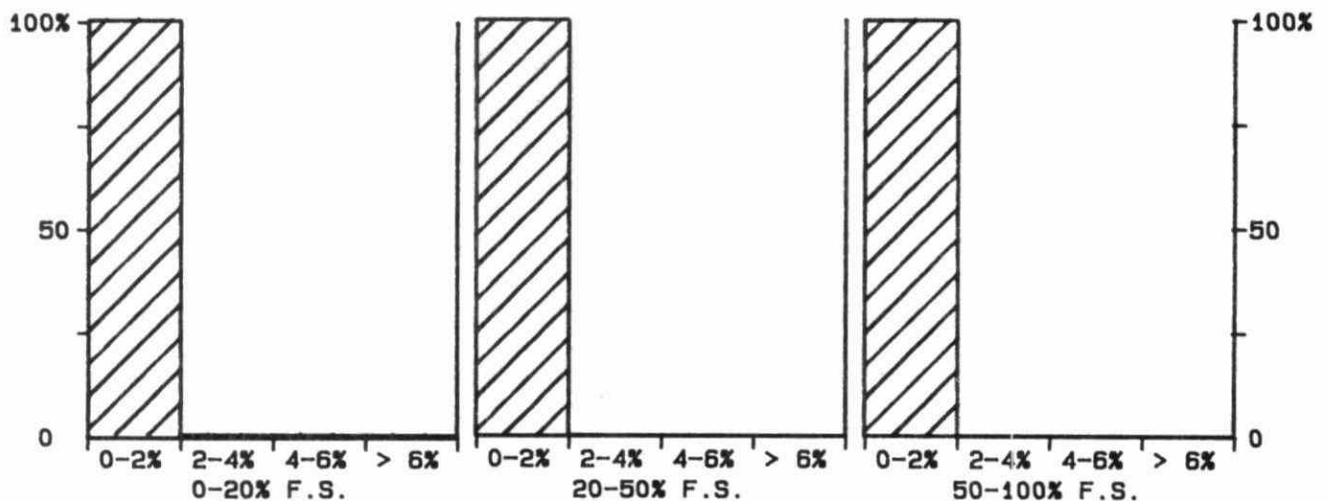
	Number of Data	Data Mean	Standard(1) Deviation
Std. cal :	95	739	123.4
Long Term Blank :	94	0.003	0.0024

QUALITY CONTROL GRAPHS NITROGEN - AMMONIA PLUS AMMONIUM (MG/L AS N)

FROM: 04/01/85
TO: 18/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 5 MG/L AS N

*** NITROGEN - AMMONIA PLUS AMMONIUM ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/78
LIS Test Name Code:	NNHTFR	Units	: mg/L as N
Work Station Code	: RNDNP	Unit Code	: 064807
Method Code	: 103DC2	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts, Effluents.		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 0.5 at 2.00 mg/L as N level.

N.B. Nitrate plus nitrite, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37 C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.002

Detection Criterion (T): 0.011

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA

Drift : BL plus one standard

MODIFICATIONS:

01/02/84 - Sample filtration was eliminated for all sample classes but Great Lakes (G).

15/05/84 - Microcomputer system was introduced. At this time the number of calibration standards was increased from 3 to 7, and the calibration technique was changed from linear interpolation to the use of a quadratic.

01/10/84 - Sample filtration was eliminated for Great Lakes (G) samples.

NITROGEN-AMMONIA PLUS AMMONIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Rivers and Lakes

Analytical Range: 0.011 to 2.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	137	1.60	1.62	0.02	0.013
b :	137	0.40	0.41	0.01	0.007
a+b :	137	2.00	2.03	0.03	0.014
a-b :	137	1.20	1.21	0.01	0.016
c :	137	0.400	0.408	0.008	0.0068
d :	137	0.200	0.206	0.006	0.0046
c+d :	137	0.600	0.613	0.013	0.0095
c-d :	137	0.200	0.202	0.002	0.0067

s.d.(AB): Sw(within run): 0.011 S(between runs): 0.010 S/Sw: 0.92
s.d.(CD): Sw(within run): 0.0047 S(between runs): 0.0058 S/Sw: 1.23

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.91 to 2.09 for A+B
1.14 to 1.26 for A-B
0.570 to 0.630 for C+D
0.180 to 0.220 for C-D

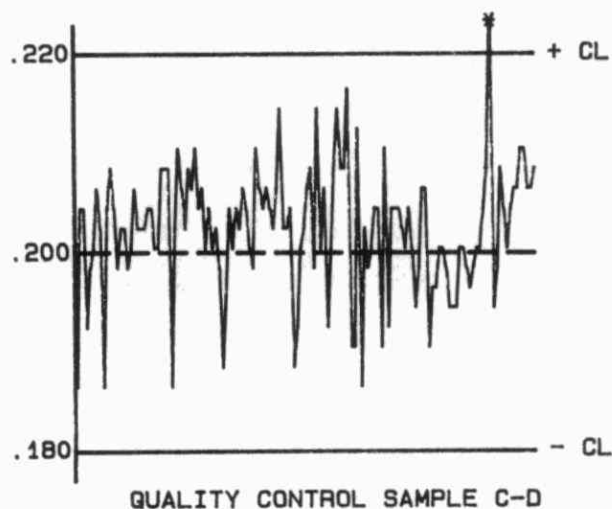
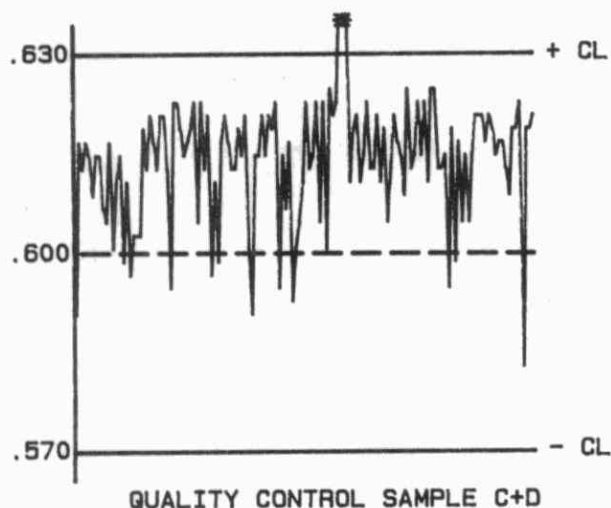
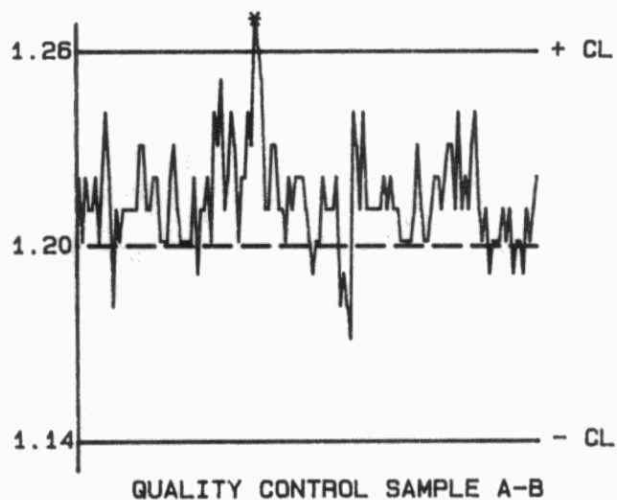
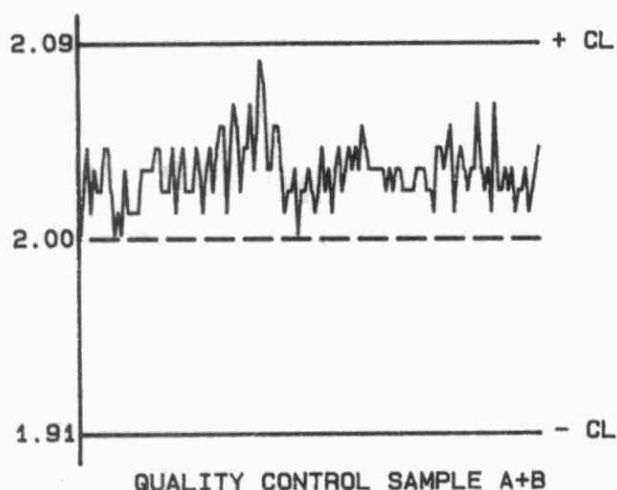
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	188	0.000 - 0.040	0.0037	16.7
	120	0.040 - 0.100	0.0103	16.6
	39	0.100 - 0.200	0.0050	3.5
	16	0.200 - 0.400	0.0099	3.4
	18	0.40 - 2.00	0.026	2.9
	381	Overall	0.009	N/A

DETECTION CRITERION: 0.011**OTHER CHECKS:**

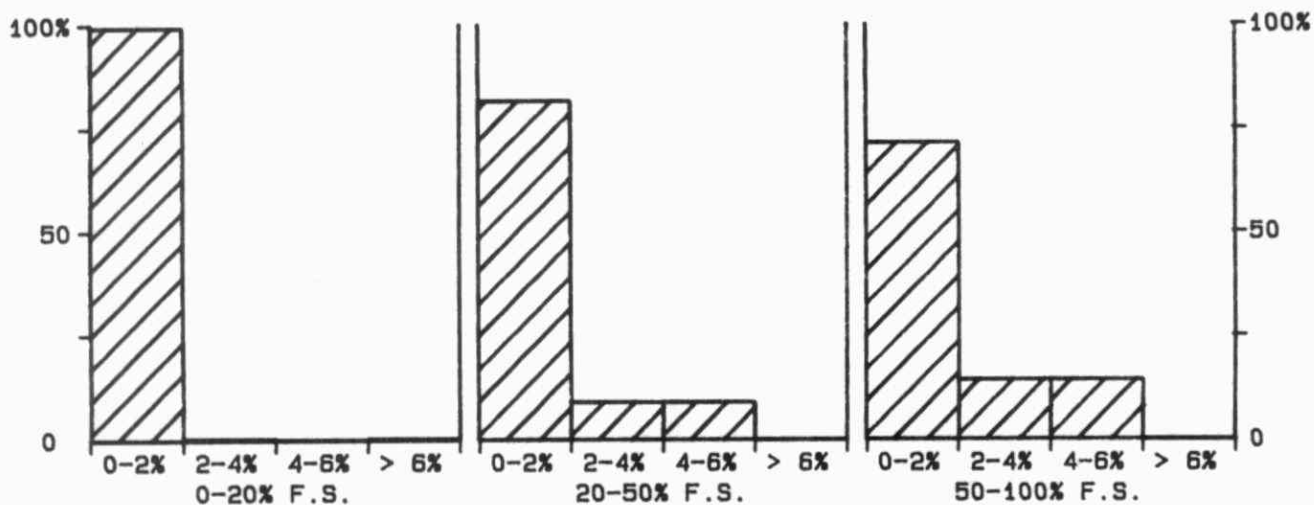
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	136	0.009	0.0058

QUALITY CONTROL GRAPHS NITROGEN-AMMONIA PLUS AMMONIUM (MG/L AS N)

FROM: 03/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS N

*** NITROGEN - AMMONIA PLUS AMMONIUM ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/77
LIS Test Name Code: NNHTFR Units : mg/L as N
Work Station Code : SNH3P Unit Code : 064807
Method Code : 103AC2 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Leachate, Domestic Waters,
Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst.
Approximate absorbance : 0.3 at 20.0 mg/L as N level.
N.B. Reactive orthophosphate is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus one 37 C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.
Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.05 Detection Criterion (T): 0.15

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 4 standards, eg, QCA
Drift : BL plus 2 standards

NITROGEN - AMMONIA PLUS AMMONIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 30/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.15 to 50.0 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	142	35.0	35.6	0.6	0.47
b :	142	14.0	14.4	0.4	0.21
a+b :	142	49.0	50.0	1.0	0.62
a-b :	142	21.0	21.2	0.2	0.39
c :	143	14.00	14.13	0.13	0.240
d :	143	3.50	3.69	0.19	0.159
c+d :	143	17.50	17.81	0.31	0.354
c-d :	143	10.50	10.44	-0.06	0.201

s.d.(AB): Sw(within run): 0.28 S(between runs): 0.36 S/Sw: 1.32
s.d.(CD): Sw(within run): 0.142 S(between runs): 0.204 S/Sw: 1.43

On any given day the calibration is accepted if the values obtained lie within the ranges:

46.8 to 51.2 for A+B
19.5 to 22.5 for A-B
16.30 to 18.70 for C+D
9.70 to 11.30 for C-D

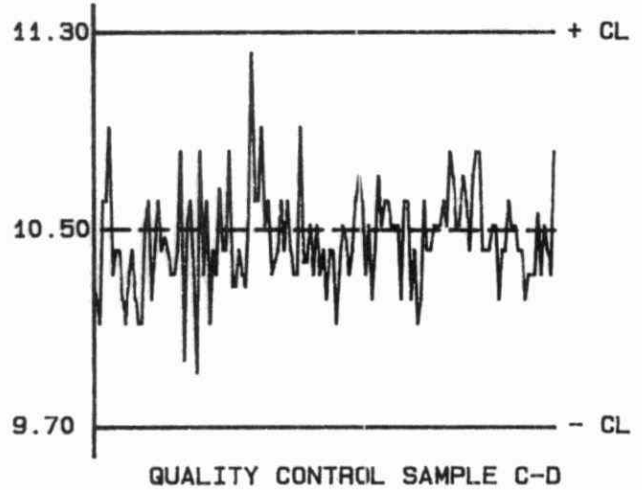
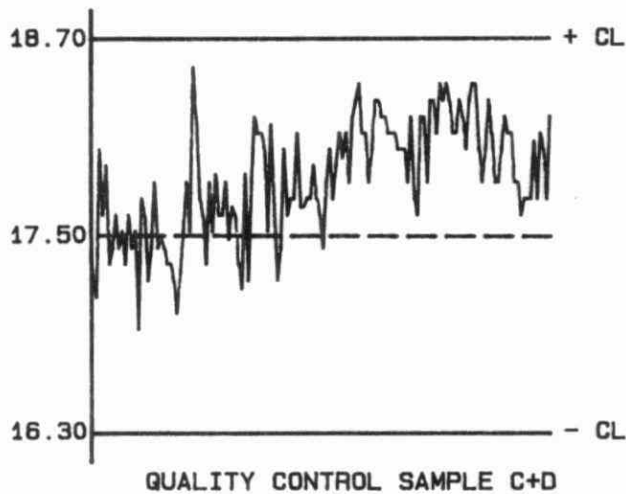
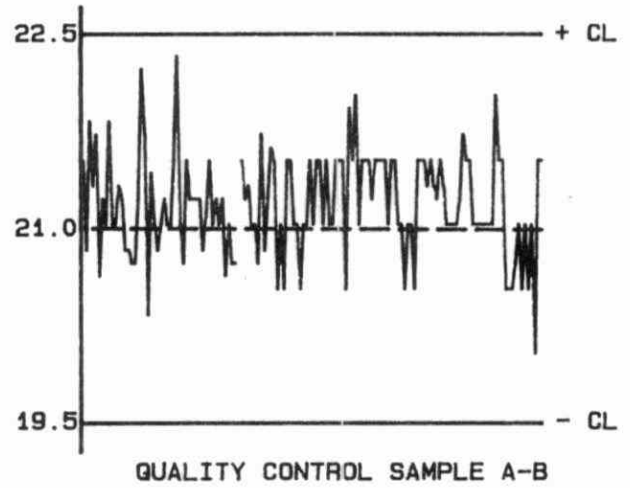
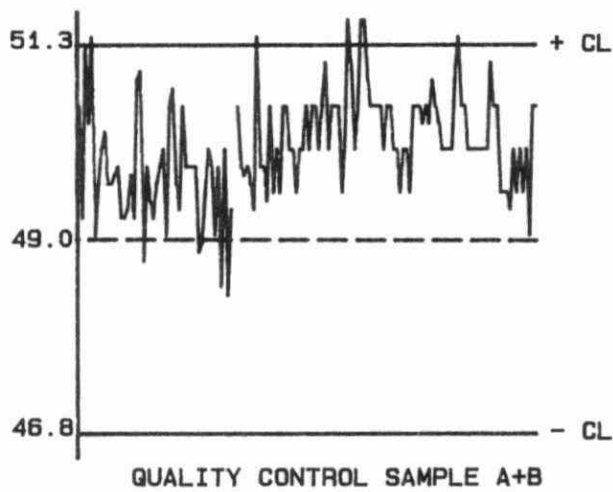
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	134	0.00 - 2.00	0.052	24.4
	14	2.00 - 5.00	0.154	4.1
	18	5.00 - 10.00	0.122	1.5
	36	10.0 - 20.0	0.15	1.0
	30	20.0 - 50.0	0.38	1.2
	232	Overall	0.16	N/A

DETECTION CRITERION: 0.15**OTHER CHECKS:**

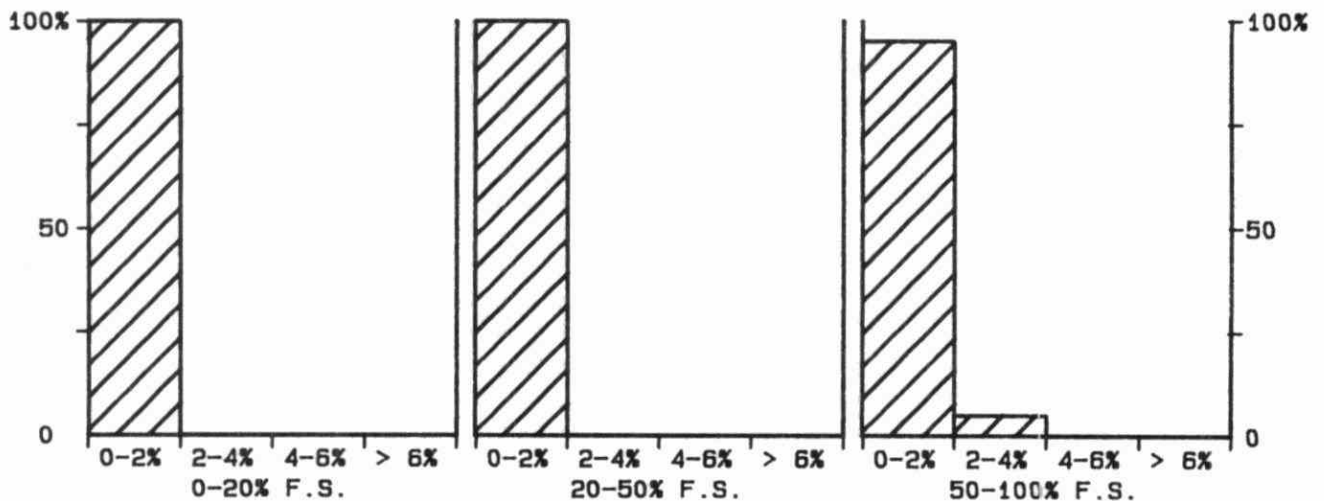
	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal	104	552	106.8
Long Term Blank	126	0.05	0.006

QUALITY CONTROL GRAPHS NITROGEN - AMMONIA PLUS AMMONIUM (MG/L AS N)

FROM: 03/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



*** NITROGEN - NITRATE ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/04/78
LIS Test Name Code:	NND3UR	Units	: mg/L as N
Work Station Code	: PRICI	Unit Code	: 064807
Method Code	: 003A10	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow.			

SAMPLING:

Quantity Required: 15 mL
Container : Polyethylene

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample extract by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by comparison of the sample scan to a series of standard scans.

Full scale conductivity : 10 $\mu\text{S}/\text{cm}$

N.B. Sulphate and chloride are determined simultaneously.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus microcomputer for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.01

Detection Criterion (T): 0.05

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration : 2 standards, eg, QCA

Drift : 1 standard every 10 samples

NITROGEN-NITRATE
 QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.05 to 2.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	140	1.60	1.60	0.00	0.013
b :	139	0.40	0.39	-0.01	0.014
a+b :	139	2.00	2.00	-0.00	0.019
a-b :	139	1.20	1.21	0.01	0.019

s.d.(AB): Sw(within run): 0.013 S(between runs): 0.014 S/Sw: 1.01

On any given day the calibration is accepted if the values obtained lie within the ranges:

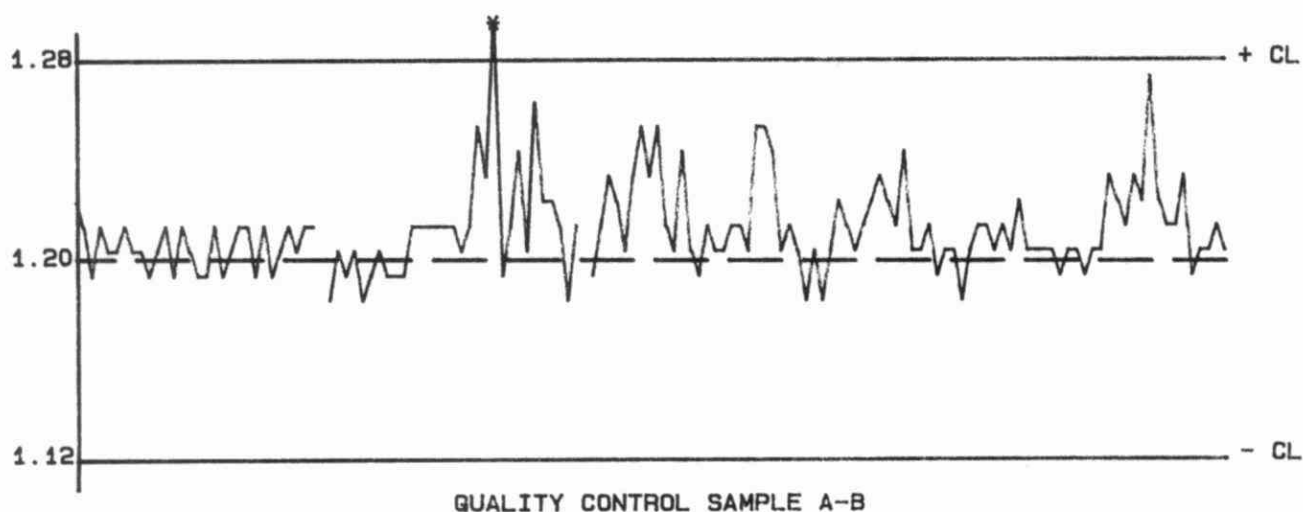
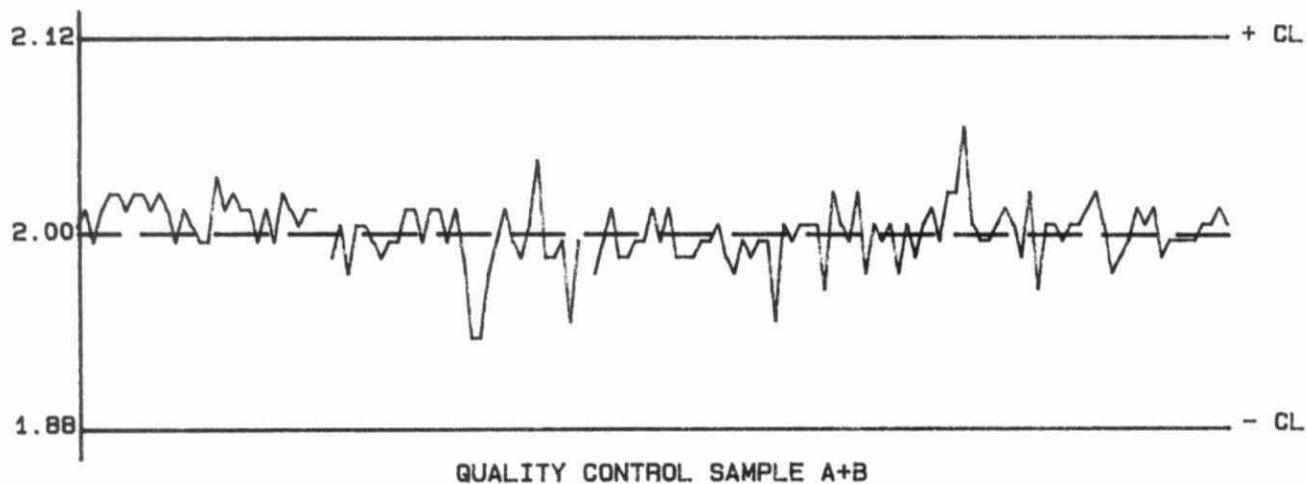
1.88 to 2.12 for A+B
 1.12 to 1.28 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	25	0.00 - 0.20	0.018	17.6
	57	0.20 - 0.50	0.011	3.3
	57	0.50 - 1.00	0.011	1.6
	33	1.00 - 2.00	0.020	1.4
	172	Overall	0.014	N/A

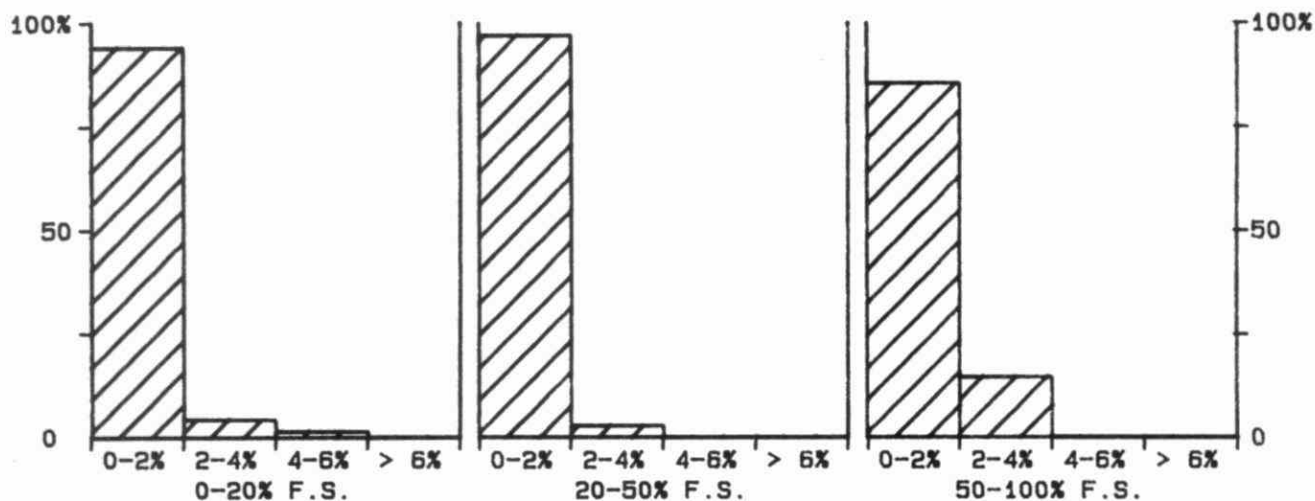
DETECTION CRITERION: 0.05

QUALITY CONTROL GRAPHS NITROGEN-NITRATE (MG/L AS N)

FROM: 02/01/85
TO: 23/12/85



--- EXPECTED VALUE
--- CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS N

*** NITROGEN - NITRATE ***

IDENTIFICATION:

Laboratory : Precipitation Method Introduced: 01/07/80
LIS Test Name Code: NNO3FR NNRICF Units : ug/Filter as N
Work Station Code : PRSEQ Unit Code : 361807
Method Code : 004AI0 Supervisor : M. Rawlings
Sample Type/Matrix: Teflon and nylon filters from sequential filter packs and
nylon filters from LoVol filter packs.

SAMPLING

Quantity Required: 1 filter
Container : Polyethylene bags

SAMPLE PREPARATION:

Filters are extracted with 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03N NaOH (nylon) in polystyrene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample extract by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by comparison of the sample scan to a series of standard scans. Results are converted to ug/filter as N.
Full scale conductivity : 30 uS/cm.
Sulphate and chloride are determined simultaneously.

INSTRUMENTATION:

-Ultrasonic bath; polystyrene tubes
-Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.25 ug/filter Detection Criterion (T): 0.5 ug/filter

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples.

MODIFICATIONS:

01/07/80 - Ion chromatographic procedure for precipitation samples was modified for analysis of Teflon and nylon filter extracts by developing the above filter extraction procedure.
10/03/84 - Microcomputer for automated sampling and timing was introduced. At that time automated spiking of samples with Na₂CO₃/NaHCO₃ was introduced.
10/05/85 - Microcomputer used for data reduction. Three additional calibration standards were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received.

NITROGEN - NITRATE
QUALITY CONTROL DATA FROM 04/01/85 TO 27/12/85

Lab: Precipitation

Analytical Range: 0.5 to 50.0 ug/Filter as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	159	40.0	40.0	0.0	0.32
b :	159	10.0	10.0	0.0	0.21
a+b :	159	50.0	50.0	0.0	0.40
a-b :	159	30.0	29.9	-0.1	0.38

s.d.(AB): Sw(within run): 0.27 S(between runs): 0.27 S/Sw: 1.01

On any given day the calibration is accepted if the values obtained lie within the ranges:

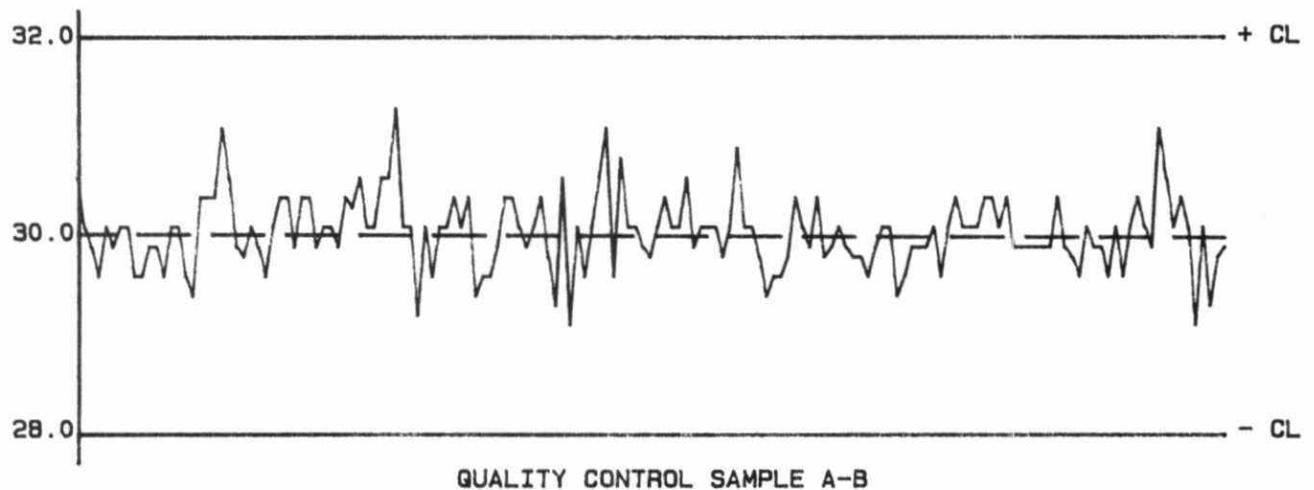
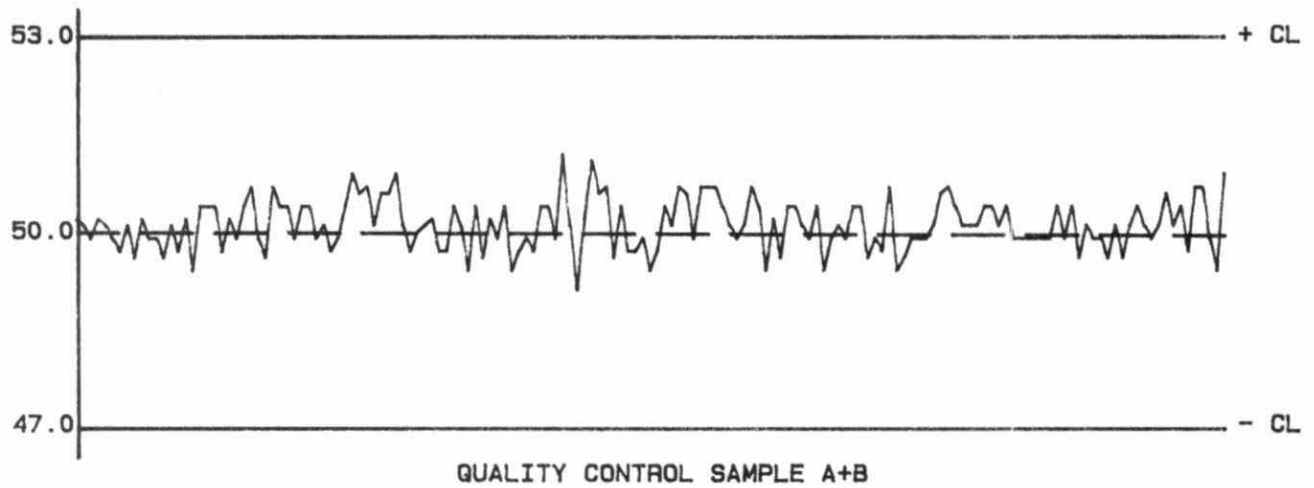
47.0 to 53.0 for A+B
 28.0 to 32.0 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	196	0.0 - 5.0	0.18	11.1
	55	5.0 - 10.0	0.34	4.6
	39	10.0 - 25.0	0.48	3.1
	24	25.0 - 50.0	0.86	2.4
	314	Overall	0.35	N/A

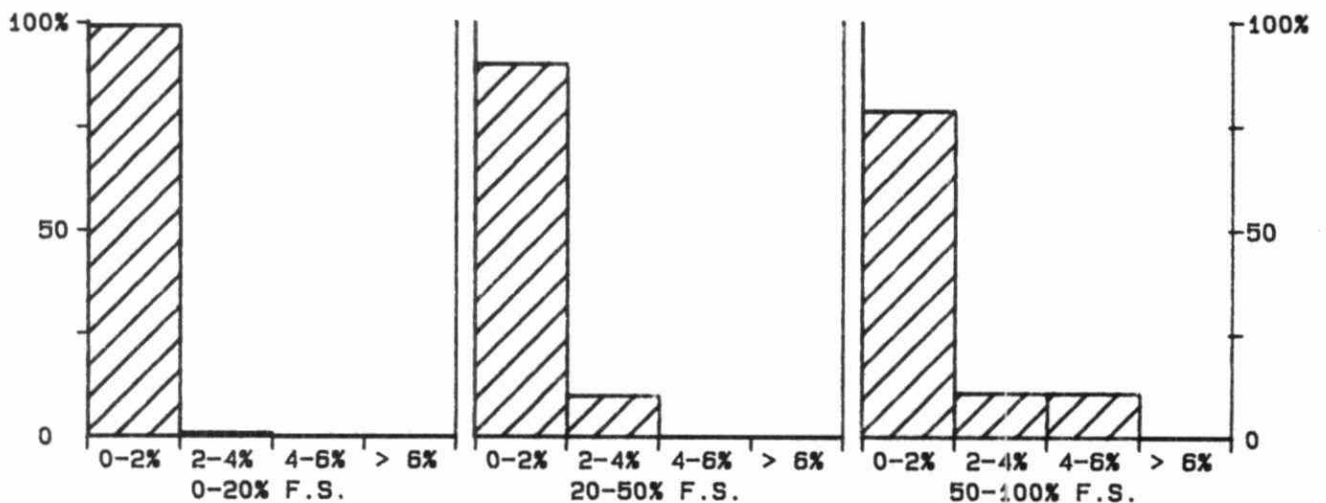
DETECTION CRITERION: 0.5

QUALITY CONTROL GRAPHS
NITROGEN - NITRATE (UG/FILTER AS N)

FROM: 04/01/85
TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 UG/FILTER AS N

*** NITROGEN - NITRATE ***

IDENTIFICATION:

Laboratory : Precipitation Method Introduced: 01/07/80
LIS Test Name Code: NND3UR Units : ug/Filter as N
Work Station Code : PRLOV Unit Code : 361807
Method Code : 004AIC Supervisor : M. Rawlings
Sample Type/Matrix: W40 filters from LoVol filter packs.

SAMPLING:

Quantity Required: 1 filter
Container : Polyethylene bag

SAMPLE PREPARATION:

Filters are extracted with 50.0mL of DDW in polyethylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by comparison of the sample scan to a series of standard scans. Results are converted to ug/filter as N.

Full scale conductivity : 30 uS/cm.

Sulphate and chloride are determined simultaneously.

INSTRUMENTATION:

- Ultrasonic bath; polyethylene tubes
- Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.5 ug/filter Detection Criterion (T): 1.2 ug/filter

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples.

MODIFICATIONS:

01/08/81 - Ion chromatographic procedure for precipitation samples was modified for analysis of LoVol W40 filter extracts by developing the above filter extraction procedure.

10/03/84 - Microcomputer for automated sampling and timing was introduced. At that time automated spiking of samples with Na₂CO₃/NaHCO₃ was introduced.

10/05/85 - Microcomputer used for data reduction. Three additional calibration standards were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received.

No data summary is available for period not covered in performance report.

NITROGEN - NITRATE
QUALITY CONTROL DATA FROM 05/02/85 TO 12/12/85

Lab: Precipitation

Analytical Range: 1.2 to 100.0 ug/Filter as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	27	80.0	79.9	-0.1	0.67
b :	27	20.0	20.0	0.0	0.43
a+b :	27	100.0	99.9	-0.1	0.84
a-b :	27	60.0	60.0	0.0	0.75

s.d.(AB): Sw(within run): 0.53 S(between runs): 0.56 S/Sw: 1.06

On any given day the calibration is accepted if the values obtained lie within the ranges:

94.0 to 106.0 for A+B
 56.0 to 64.0 for A-B

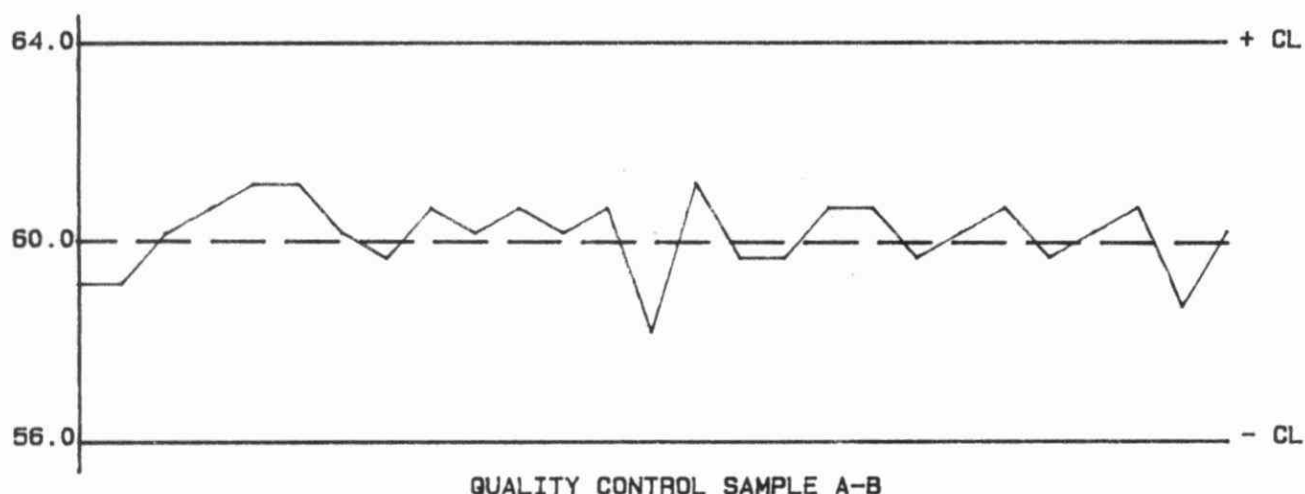
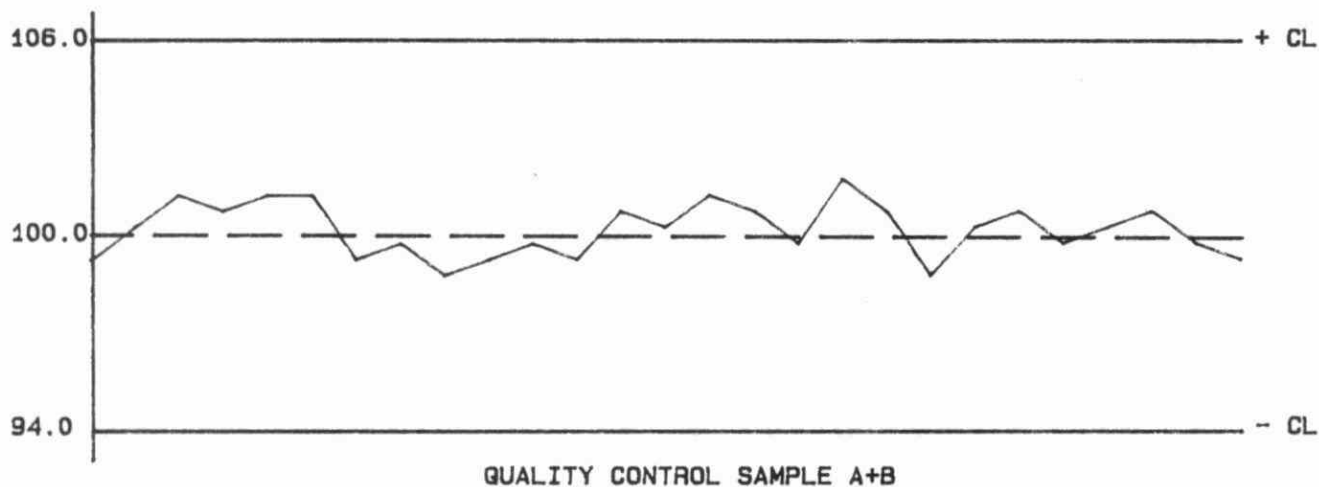
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	24	0.0 - 10.0	0.41	9.7
	5	10.0 - 25.0	0.82	4.4
	7	25.0 - 50.0	1.19	3.4
	2	50.0 - 100.0	0.56	0.8
	38	Overall	0.69	N/A

DETECTION CRITERION: 1.2

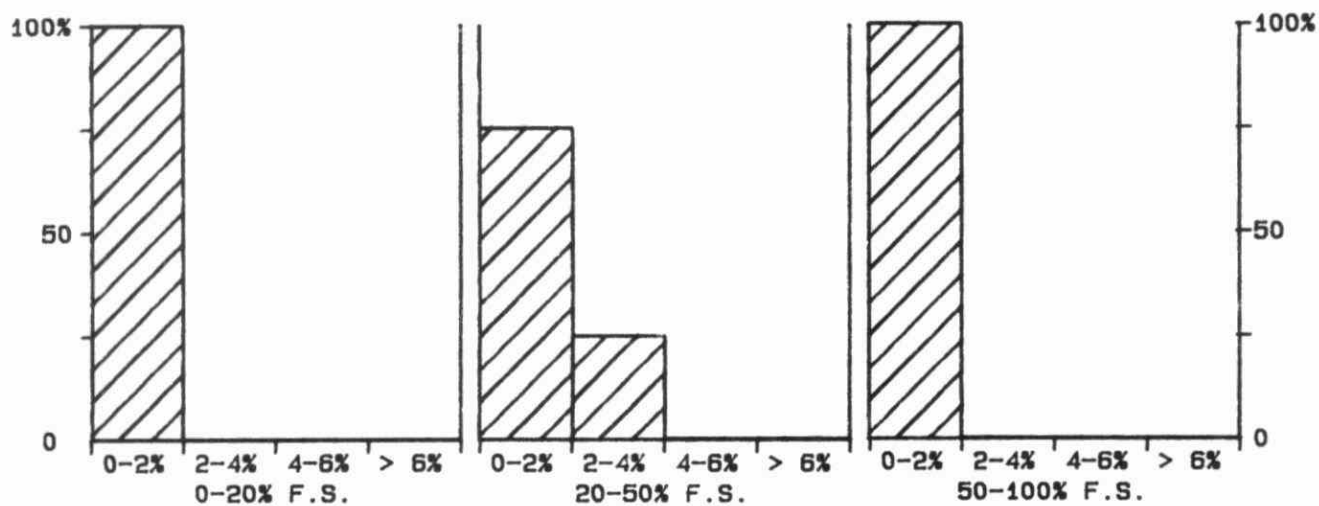
QUALITY CONTROL GRAPHS NITROGEN - NITRATE (UG/FILTER AS N)

FROM: 05/02/85

TO: 12/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 UG/FILTER AS N

*** NITROGEN - NITRATE PLUS NITRITE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	01/04/78
LIS Test Name Code:	NNOTUR	Units	: mg/L as N
Work Station Code	: WFN03	Unit Code	: 064807
Method Code	: 002CC2	Supervisor	: M. Rawlings
Sample Type/Matrix:	Ministry of Health Water Samples		

SAMPLING:

Quantity Required: 75 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37 C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and NK 1-naphthyl)ethylenediaminedihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.
Approximate absorbance : 0.5 at 20.0 mg/L as N level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37 C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 5.0 cm. light path at 520 nm.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.1	Detection Criterion (T): 0.1

CALIBRATION:

BL plus 1 standard in duplicate

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL plus 2 standards

NITROGEN-NITRATE+NITRITE
QUALITY CONTROL DATA FROM 02/01/85 TO 27/12/85

Lab: Domestic Water

Analytical Range: 0.1 to 20.0 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	72	15.0	14.9	-0.1	0.17
b :	72	3.0	3.0	0.0	0.09
a+b :	72	18.0	17.9	-0.1	0.23
a-b :	72	12.0	11.9	-0.1	0.15

s.d.(AB): Sw(within run): 0.11 S(between runs): 0.14 S/Sw: 1.28

On any given day the calibration is accepted if the values obtained lie within the ranges:

17.1 to 18.9 for A+B
 11.4 to 12.6 for A-B

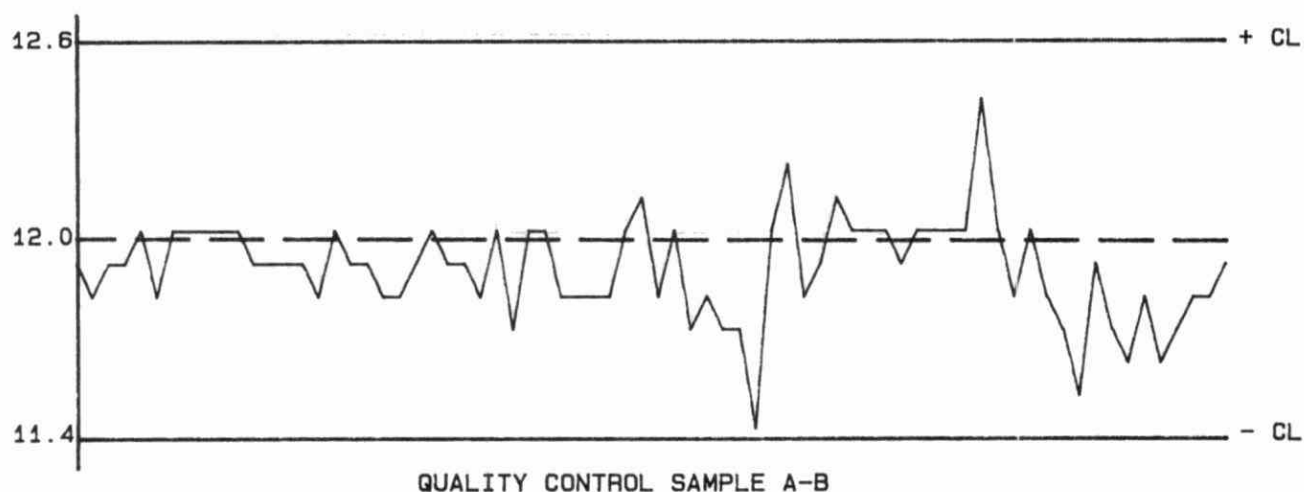
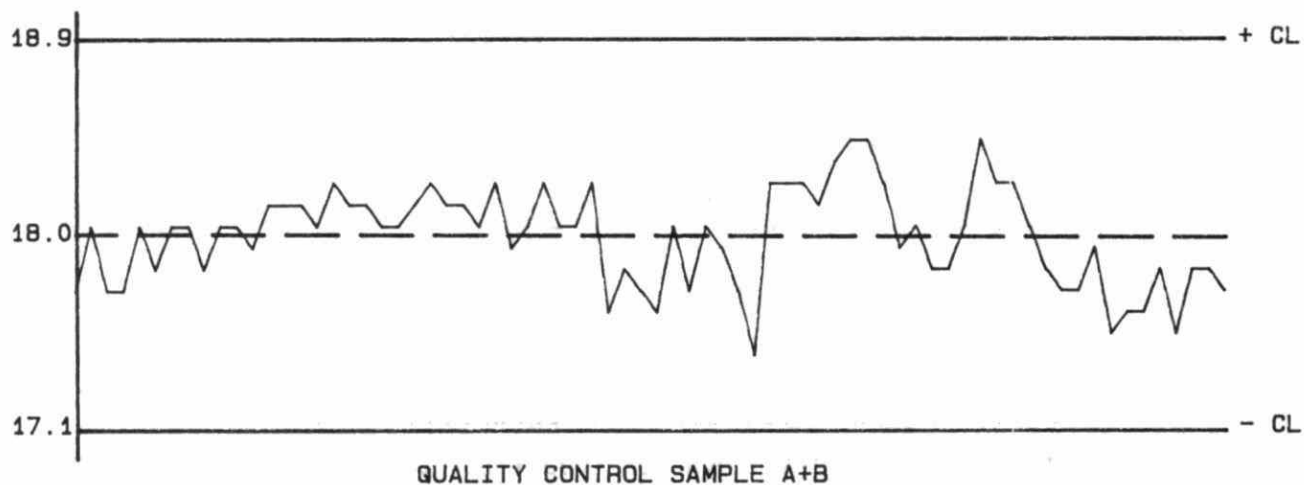
DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
143	0.0 - 2.0	0.03	7.4
32	2.0 - 5.0	0.07	2.1
14	5.0 - 10.0	0.08	1.0
10	10.0 - 20.0	0.07	0.5
199	Overall	0.05	N/A

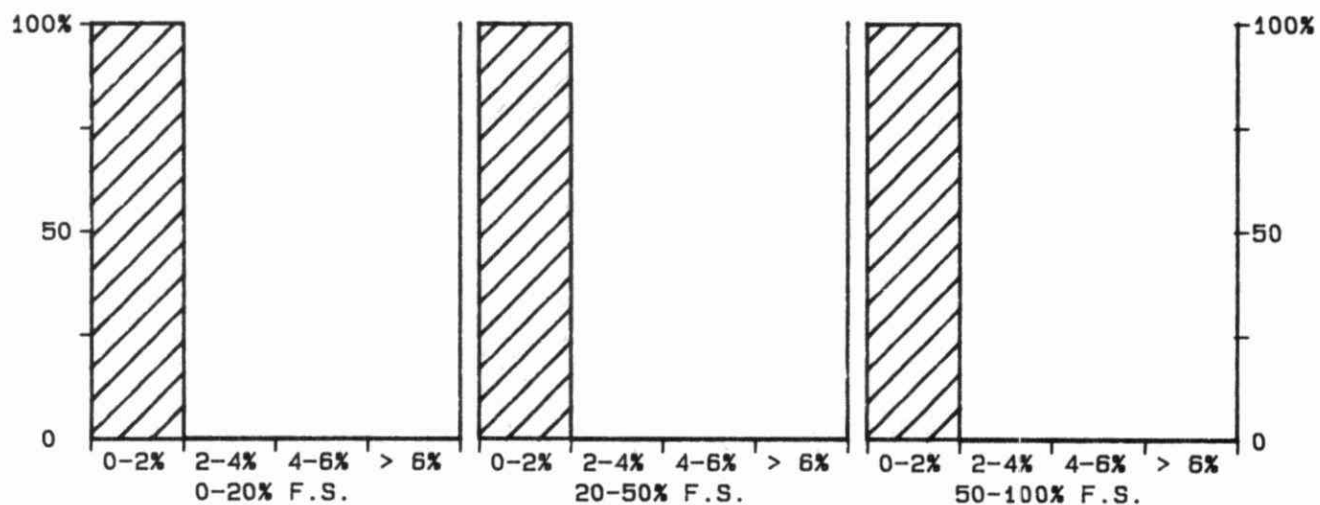
DETECTION CRITERION: 0.1

QUALITY CONTROL GRAPHS NITROGEN-NITRATE+NITRITE (MG/L AS N)

FROM: 02/01/85
TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 MG/L AS N

*** NITROGEN - NITRATE PLUS NITRITE ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 13/06/78
Supervisor : F. Tomassini Units : ug/L as N
Sample Type/Matrix: Streams, Lakes, Precipitation

SAMPLING:

Quantity Required: 50 mL
Container : Plastic (polystyrene)

SAMPLE PREPARATION:

Samples are filtered through 0.45u membrane filters.

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the filtrate of a sample. Nitrate is reduced to nitrite in alkaline media at 37 C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl)ethylenediaminedihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance : 0.4 at the 500 ug/L as N level.

N.B. Ammonia plus ammonium is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37 C heating bath (7.7 ml. delay), ion exchange column. Colourimetric measurement is through a 5.0 cm. light path at 520 nm.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 2

Detection Criterion (T): 9

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA

Drift : BL plus 1 standard every 10 samples

NITROGEN - NITRATE PLUS NITRITE
QUALITY CONTROL DATA FROM 10/01/85 TO 19/12/85

Lab: Dorset

Analytical Range: 9 to 500 ug/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard (1) Deviation
a :	49	350	354	4	3.8
b :	49	125	128	3	2.8
a+b :	49	475	482	7	5.6
a-b :	49	225	226	1	3.8

s.d.(AB): Sw(within run): 2.7 S(between runs): 3.3 S/Sw: 1.24

On any given day the calibration is accepted if the values obtained lie within the ranges:

445 to 505 for A+B
 205 to 245 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean (2) s.d.	Coefficient of var. (%)
	75	0 - 50	3.0	16.2
	25	50 - 100	3.5	4.6
	20	100 - 250	3.6	2.3
	7	250 - 500	4.2	1.3
	127	Overall	3.3	N/A

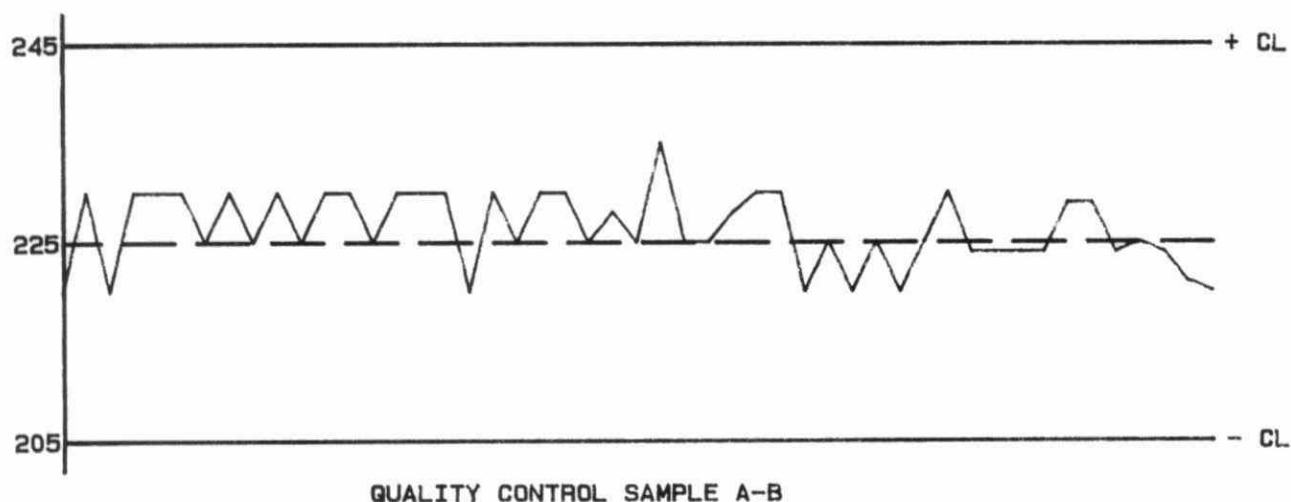
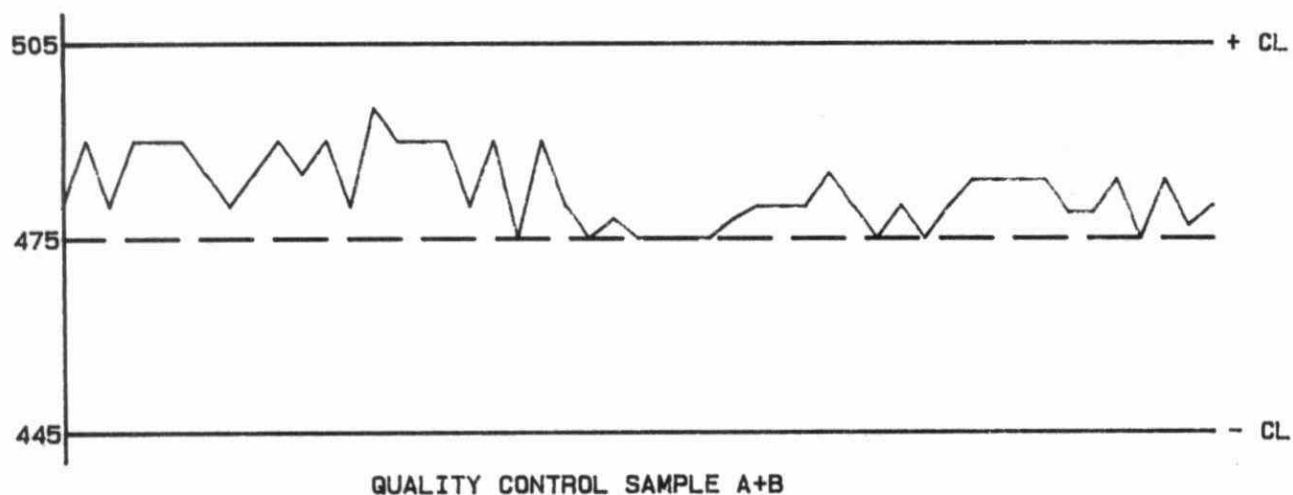
DETECTION CRITERION: 9

OTHER CHECKS:

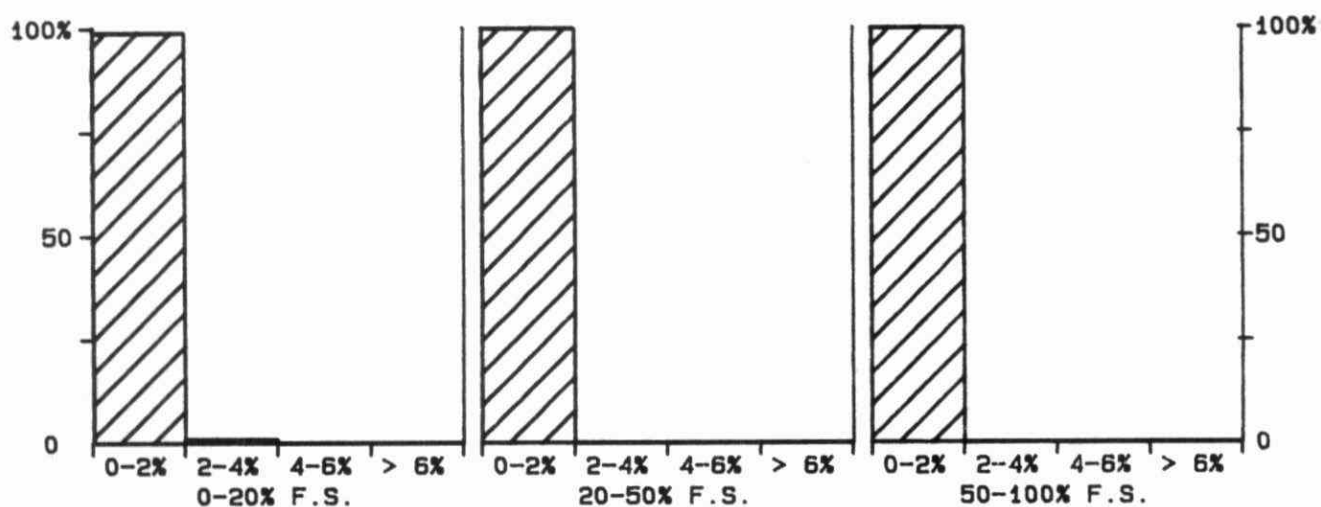
	Number of Data	Data Mean	Standard (1) Deviation
Std. Cal.	49	336	70.7
Long Term Blank	49	0	0.7

QUALITY CONTROL GRAPHS NITROGEN - NITRATE PLUS NITRITE (UG/L AS N)

FROM: 10/01/85
TO: 19/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 500 UG/L AS N

*** NITROGEN - NITRATE PLUS NITRITE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/78
LIS Test Name Code:	NNOTFR	Units	: mg/L as N
Work Station Code	: RNDNP	Unit Code	: 064807
Method Code	: 102DC2	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents.			

SAMPLING:

Quantity Required: 50 mL
 Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37 C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and NK 1-naphthyl)ethylenediaminedihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance : 0.5 at the 5.00 mg/L as N level.

N.B. Ammonia plus ammonium, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37 C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.005

Detection Criterion (T): 0.06

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration : LTBL plus 3 standards
 Drift : BL plus 1 standard

MODIFICATIONS:

01/02/84 - Sample filtration was eliminated for all sample classes but Great Lakes (G).

15/05/84 - Microcomputer system was introduced. At this time the number of calibration standards was increased from 3 to 7, and the calibration technique was changed from linear interpolation to the use of a quadratic.

01/10/84 - Sample filtration was eliminated for Great Lakes (G) samples.

NITROGEN-NITRATE PLUS NITRITE
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Rivers and Lakes

Analytical Range: 0.06 to 5.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	137	4.00	3.98	-0.02	0.039
b :	137	1.00	1.00	0.00	0.017
a+b :	137	5.00	4.98	-0.02	0.045
a-b :	137	3.00	2.98	-0.02	0.040
c :	137	1.00	1.00	0.00	0.017
d :	137	0.50	0.50	-0.00	0.015
c+d :	137	1.50	1.50	-0.00	0.030
c-d :	137	0.50	0.50	0.00	0.013

s.d.(AB): Sw(within run): 0.028 S(between runs): 0.030 S/Sw: 1.06
s.d.(CD): Sw(within run): 0.009 S(between runs): 0.016 S/Sw: 1.74

On any given day the calibration is accepted if the values obtained lie within the ranges:

4.77 to 5.23 for A+B
2.85 to 3.15 for A-B
1.43 to 1.58 for C+D
0.45 to 0.55 for C-D

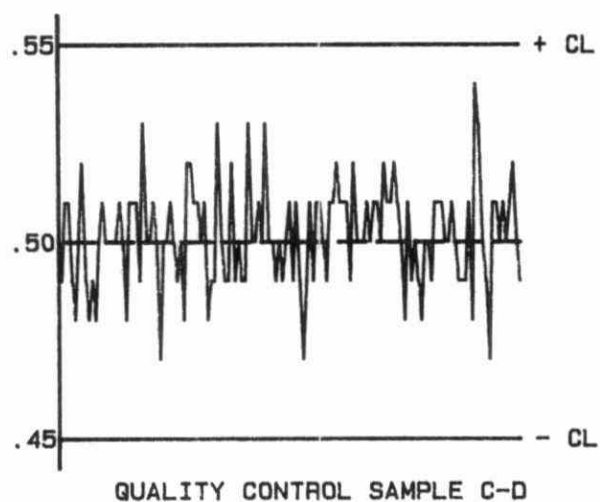
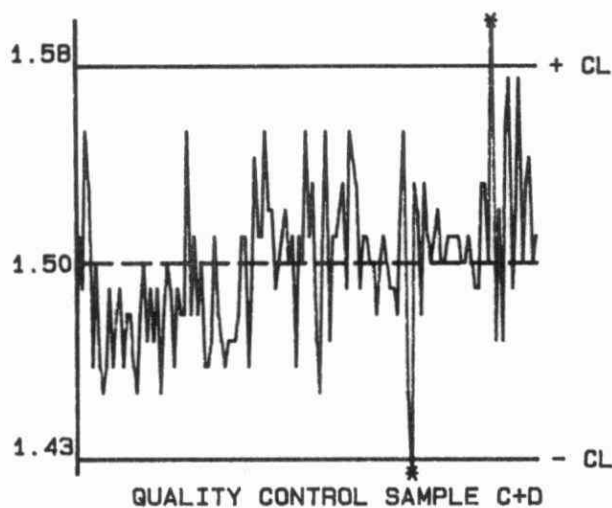
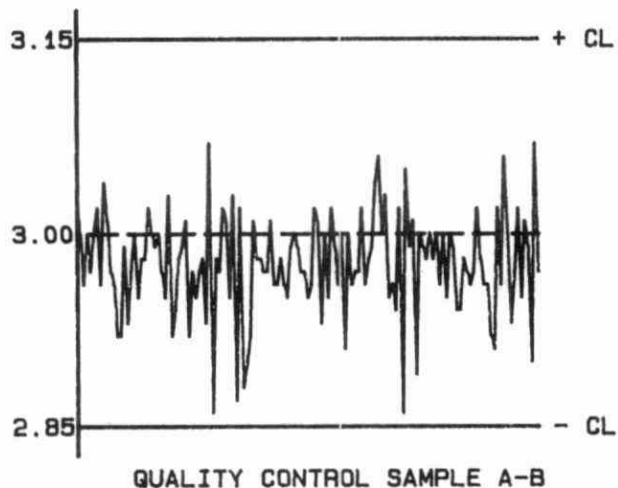
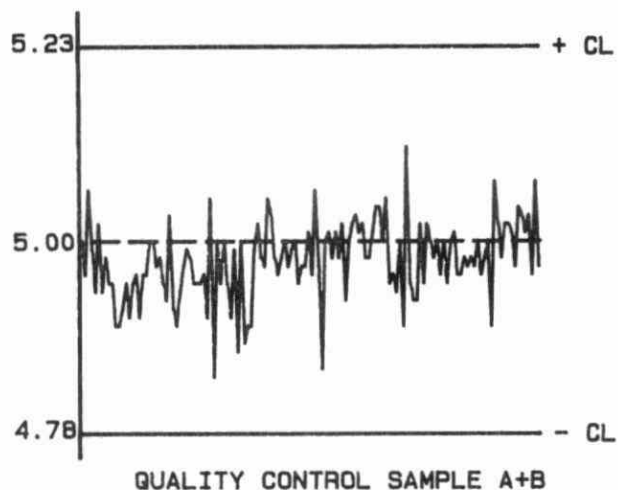
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	144	0.00 - 0.20	0.020	28.9
	69	0.20 - 0.50	0.032	10.1
	41	0.50 - 1.00	0.031	4.3
	83	1.00 - 2.50	0.075	4.4
	33	2.50 - 5.00	0.079	2.2
	370	Overall	0.047	N/A

DETECTION CRITERION: 0.06**OTHER CHECKS:**

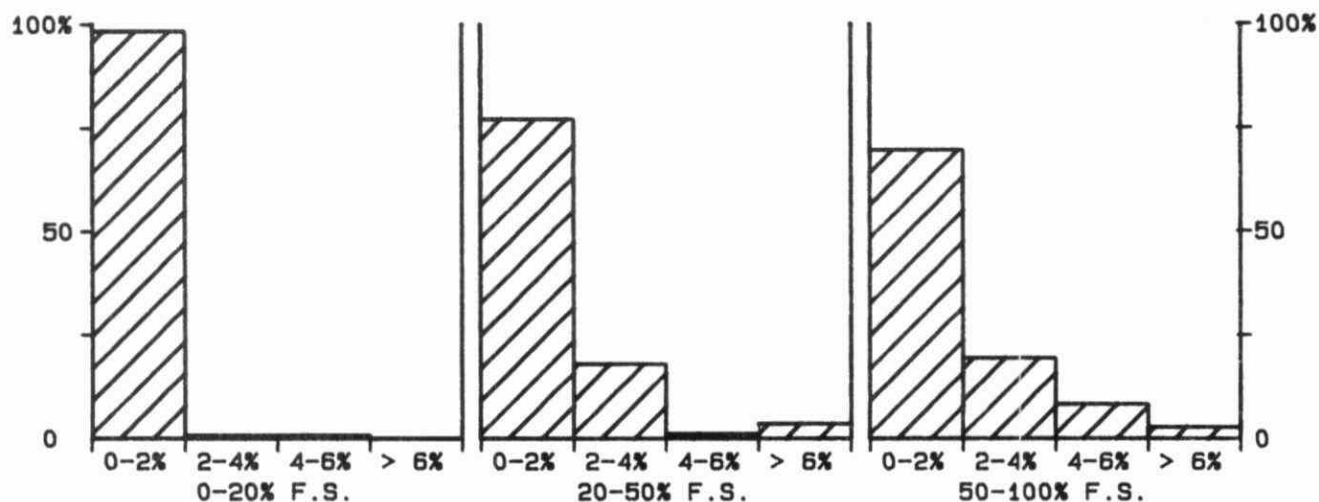
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	136	0.02	0.010

QUALITY CONTROL GRAPHS NITROGEN-NITRATE PLUS NITRITE (MG/L AS N)

FROM: 03/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 5 MG/L AS N

*** NITROGEN - NITRATE PLUS NITRITE ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/76
LIS Test Name Code: NNDTFR Units : mg/L as N
Work Station Code : SNO2NO3 Unit Code : 064807
Method Code : 102CC2 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Leachate, Domestic Waters,
Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37 C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and NK 1-naphthyl)ethylenediaminedihydrochloride. Approximate absorbance : 0.2 at 20.0 mg/L as N level.
N.B. Nitrite is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37 C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm light path at 520 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.05 Detection Criterion (T): 0.24

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 4 standards
Drift : BL plus 2 standards
Interference: Nitrite standard (nitrate and nitrite at same concentration run separately: zero difference is expected) confirms effective operation of reduction step. Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective operation of ion exchange column.

MODIFICATIONS:

01/06/85 - Ion exchange column was removed and replaced by increasing in-line sample dilution to the point that the interference check could be retained and no loss in performance was observed.

NITROGEN - NITRATE PLUS NITRITE
QUALITY CONTROL DATA FROM 03/01/85 TO 27/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.24 to 50.0 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	114	35.0	35.3	0.3	0.37
b :	114	15.4	15.7	0.3	0.27
a+b :	114	50.4	51.0	0.6	0.55
a-b :	114	19.6	19.7	0.1	0.35
c :	114	15.40	15.66	0.26	0.213
d :	114	4.20	4.33	0.13	0.089
c+d :	114	19.60	19.99	0.39	0.265
c-d :	114	11.20	11.33	0.13	0.190

s.d.(AB): Sw(within run): 0.25 S(between runs): 0.32 S/Sw: 1.31
s.d.(CD): Sw(within run): 0.134 S(between runs): 0.163 S/Sw: 1.21

On any given day the calibration is accepted if the values obtained lie within the ranges:

47.4 to 53.4 for A+B
17.6 to 21.6 for A-B
18.70 to 20.50 for C+D
10.60 to 11.80 for C-D

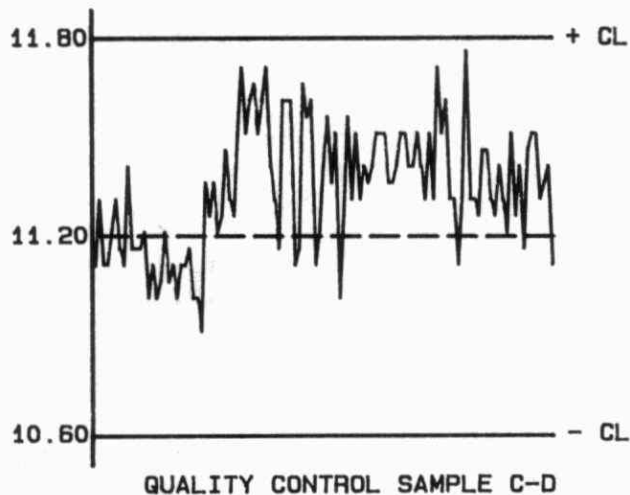
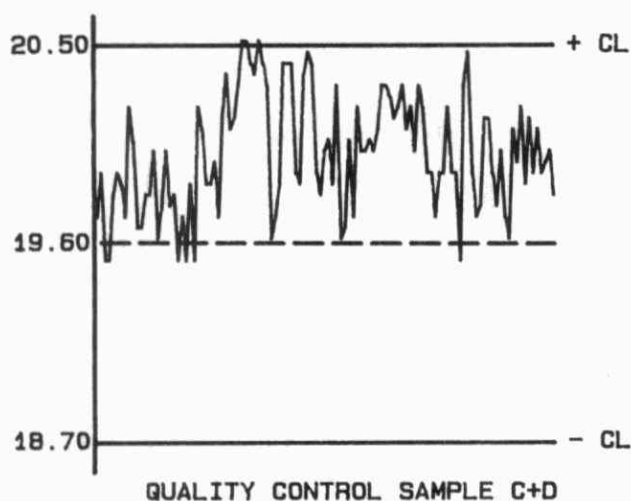
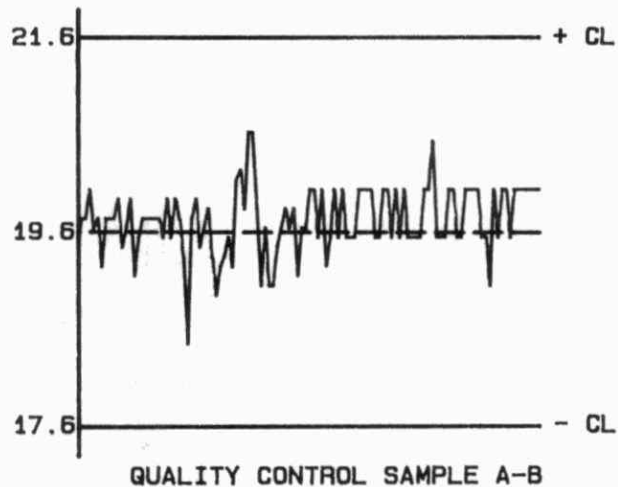
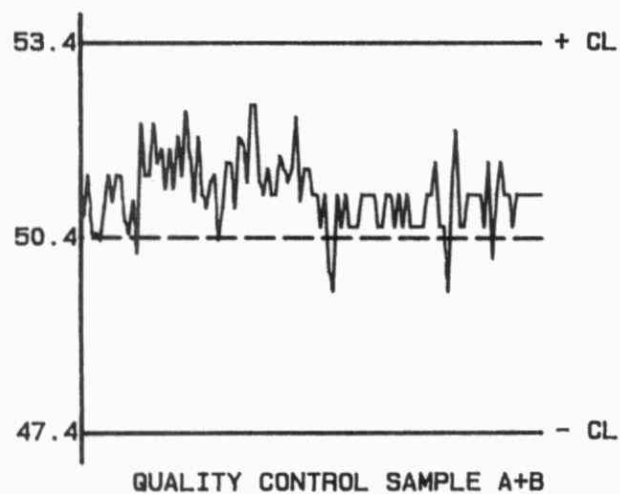
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	235	0.00 - 2.00	0.080	19.6
	36	2.00 - 5.00	0.100	2.8
	31	5.00 - 10.00	0.115	1.7
	27	10.0 - 20.0	0.24	1.6
	6	20.0 - 50.0	0.43	1.5
	335	Overall	0.12	N/A

DETECTION CRITERION: 0.24**OTHER CHECKS:**

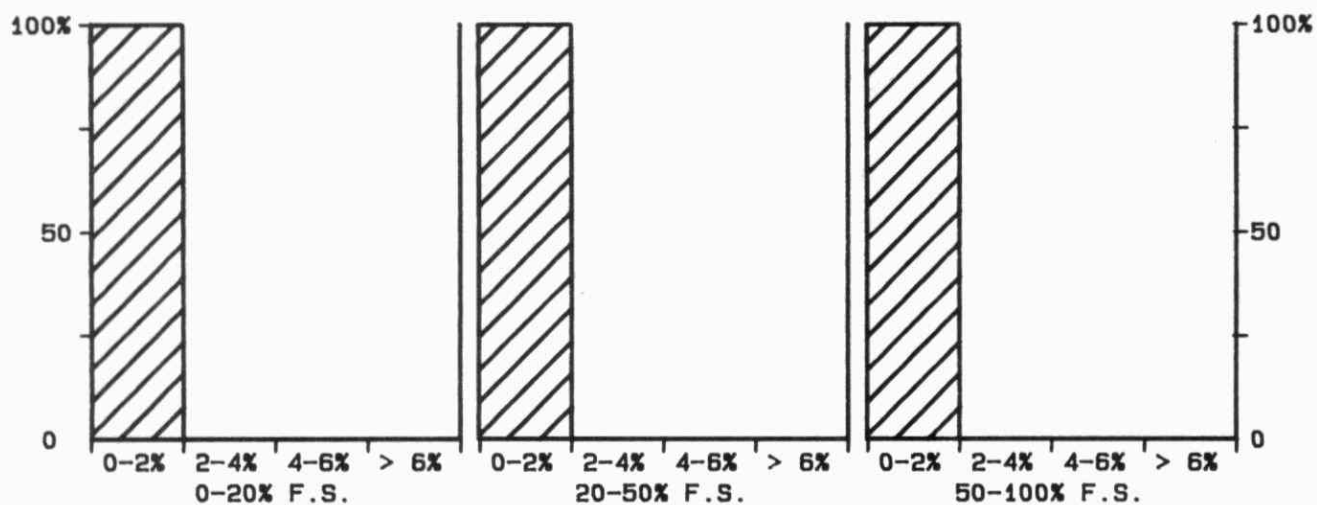
	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal :	112	551	78.4
NO3-NO2 :	105	0.10	0.188
NO3-Ca/Mg :	104	0.01	0.286
Long Term Blank :	65	0.05	0.000

QUALITY CONTROL GRAPHS NITROGEN - NITRATE PLUS NITRITE (MG/L AS N)

FROM: 03/01/85
TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 MG/L AS N

*** NITROGEN - NITRITE ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/78
LIS Test Name Code: NND2FR Units : mg/L as N
Work Station Code : RNDNP Unit Code : 064807
Method Code : 102DC2 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents.

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide and N(1-naphthyl)-ethylenediamine dihydrochloride. Approximate absorbance : 0.6 at the 0.25 mg/L as N level.
N.B. Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm.
Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.0005 Detection Criterion (T): 0.003

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration : LTBL plus 3 standards, e.g., QCA
Drift : BL plus 1 standard

MODIFICATIONS:

01/02/84 - Sample filtration was eliminated for all sample classes but Great Lakes (G).
15/05/84 - Microcomputer system was introduced. At this time the number of calibration standards was increased from 3 to 7, and the calibration technique was changed from linear interpolation to the use of a quadratic.
01/10/84 - Sample filtration was eliminated for Great Lakes (G) samples.

NITROGEN-NITRITE
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Rivers and Lakes

Analytical Range: 0.003 to 0.250 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	138	0.200	0.198	-0.002	0.0020
b :	138	0.050	0.050	-0.000	0.0011
a+b :	138	0.250	0.248	-0.002	0.0023
a-b :	138	0.150	0.149	-0.001	0.0022
c :	138	0.050	0.050	-0.000	0.0011
d :	137	0.025	0.025	-0.000	0.0010
c+d :	137	0.075	0.074	-0.001	0.0018
c-d :	137	0.025	0.025	-0.000	0.0010

s.d.(AB): Sw(within run): 0.0016 S(between runs): 0.0016 S/Sw: 1.04
s.d.(CD): Sw(within run): 0.0007 S(between runs): 0.0011 S/Sw: 1.49

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.239 to 0.261 for A+B
0.142 to 0.157 for A-B
0.067 to 0.082 for C+D
0.020 to 0.030 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	202	0.000 - 0.010	0.0010	24.1
	63	0.010 - 0.020	0.0018	12.9
	92	0.020 - 0.100	0.0037	8.4
	16	0.100 - 0.250	0.0068	4.1
	373	Overall	0.0026	N/A

DETECTION CRITERION: 0.003

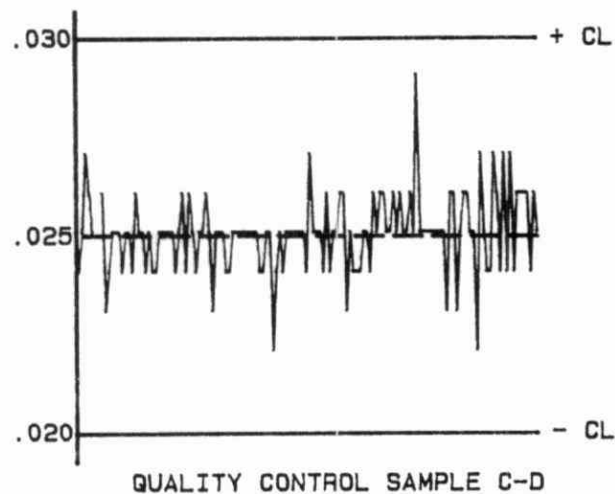
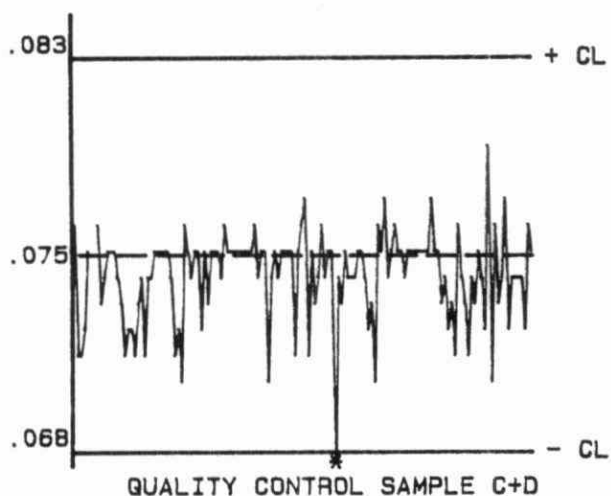
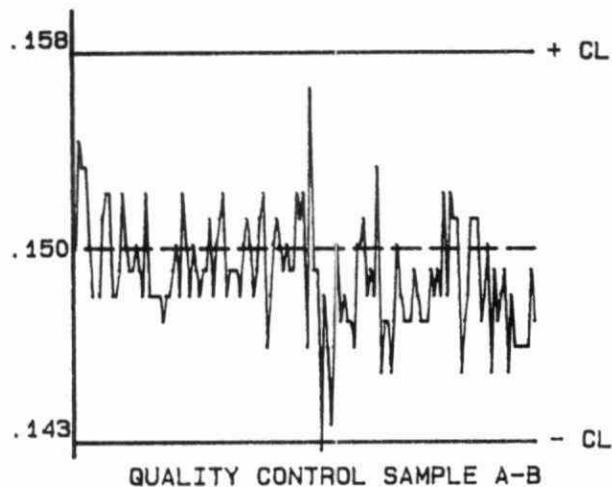
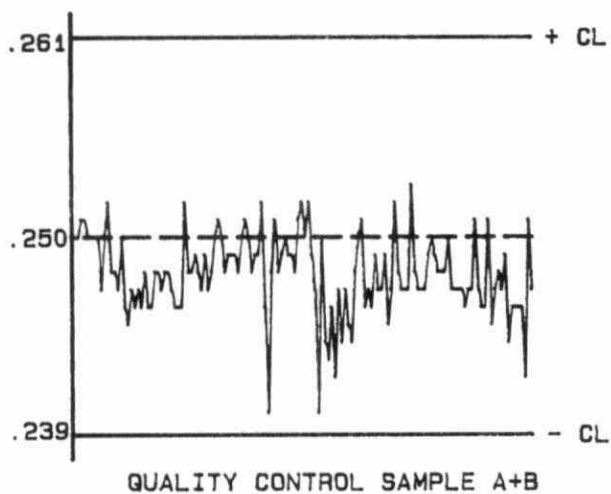
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	135	0.002	0.0008

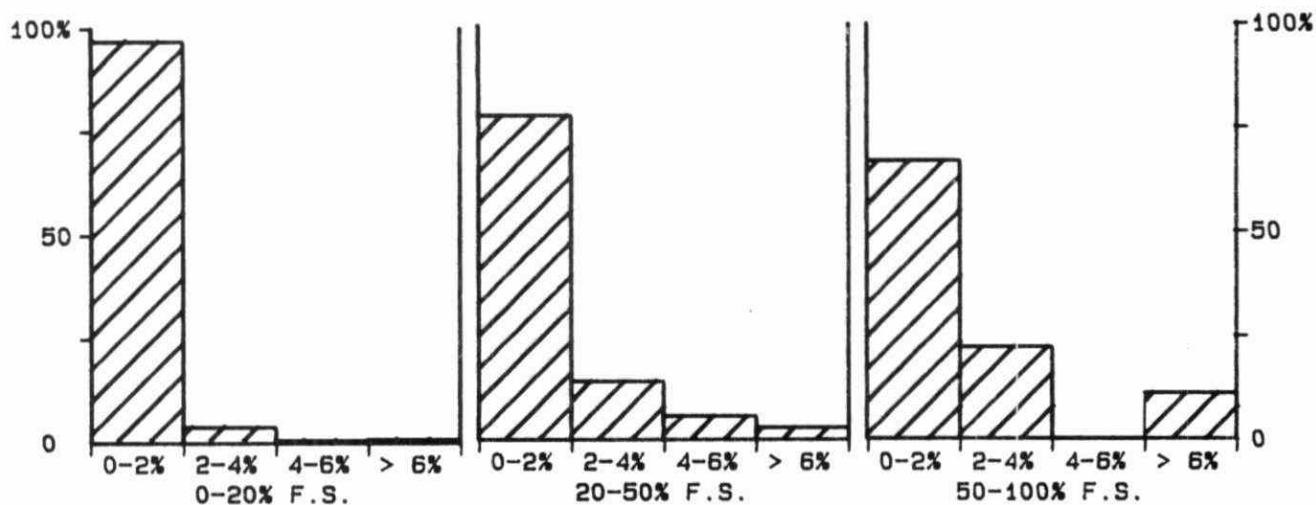
QUALITY CONTROL GRAPHS NITROGEN-NITRITE (MG/L AS N)

FROM: 03/01/85

TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): .25 MG/L AS N

*** NITROGEN - NITRITE ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/76
LIS Test Name Code: NND2FR Units : mg/L as N
Work Station Code : SNO2N03 Unit Code : 064807
Method Code : 102CC2 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Leachate, Domestic Waters,
Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide and N(1-naphthyl)-ethylenediamine dihydrochloride. Approximate absorbance : 0.4 at the 2.0 mg/L as N level.
N.B. Nitrate plus nitrite is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.005 Detection Criterion (T): 0.009

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA
Drift : BL plus 2 standards

NITROGEN - NITRITE
QUALITY CONTROL DATA FROM 03/01/85 TO 27/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.009 to 2.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
c :	112	1.400	1.398	-0.002	0.0271
d :	112	0.700	0.692	-0.008	0.0239
c+d :	112	2.100	2.090	-0.010	0.0494
c-d :	112	0.700	0.707	0.007	0.0132

s.d.(CD): Sw(within run): 0.0093 S(between runs): 0.0256 S/Sw: 2.74

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.950 to 2.250 for C+D
 0.600 to 0.800 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	283	0.000 - 0.200	0.0031	17.0
	34	0.20 - 1.00	0.025	4.9
	8	1.00 - 2.00	0.043	3.1
	325	Overall	0.011	N/A

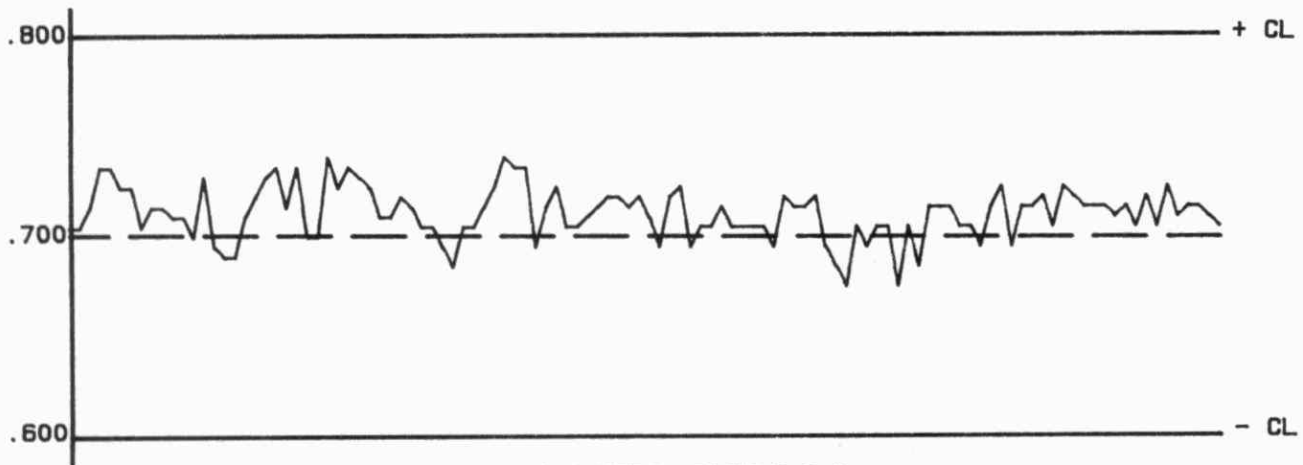
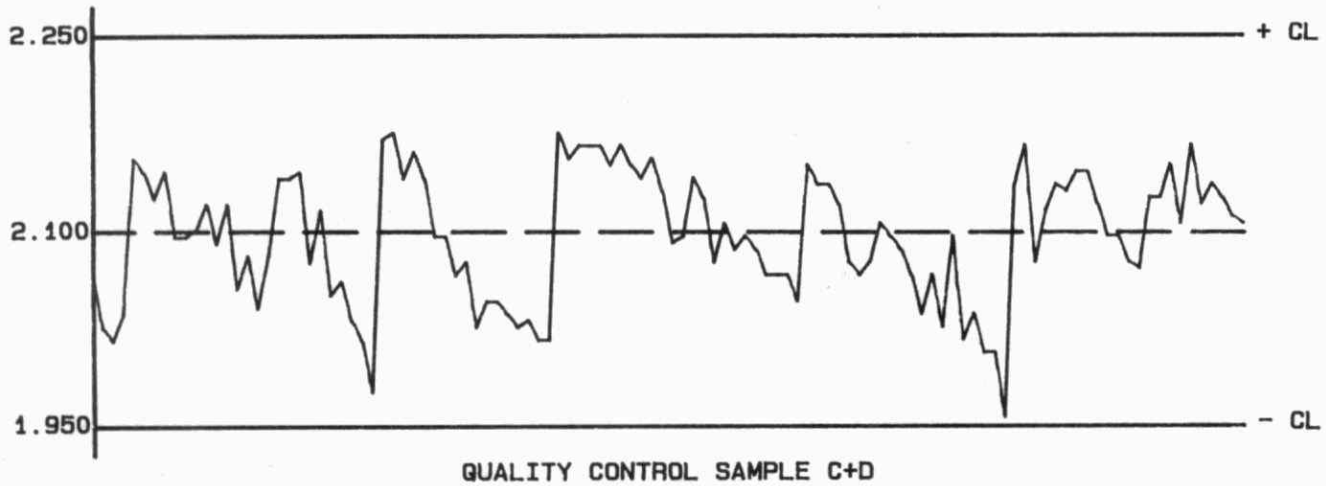
DETECTION CRITERION: 0.009

OTHER CHECKS:	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal	112	443	32.9
Long Term Blank	65	0.005	0.0006

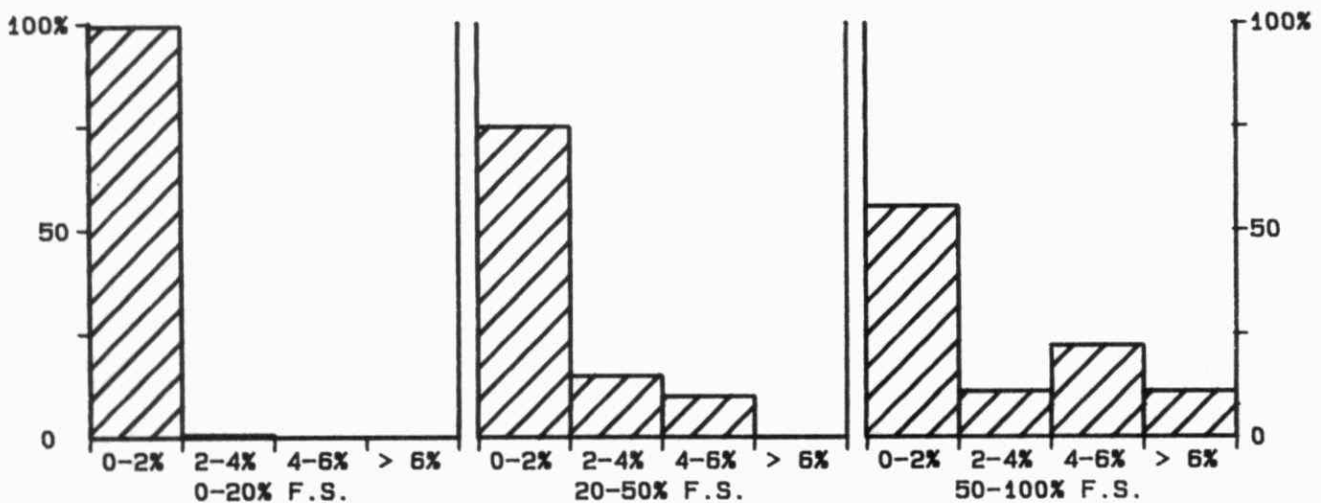
QUALITY CONTROL GRAPHS NITROGEN - NITRITE (MG/L AS N)

FROM: 03/01/85

TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS N

*** NITROGEN-TOTAL KJELDAHL ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/79
LIS Test Name Code: NNTKUR Units : mg/L as N
Work Station Code : RTNP Unit Code : 064807
Method Code : 004AC2 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents.

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters kept at 200 C and 360 C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst. Approximate absorbance : 0.5 at the 2.0 mg/L as N level.
N.B. Total phosphorus is determined simultaneously.

INSTRUMENTATION:

-Block digesters(2)
-Basic automated modular continuous flow system plus 1 module:37 C bath(7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm.
-Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.06

CALIBRATION:

BL plus 3 undigested standards

CONTROLS:

Calibration : LTBL plus 2 undigested standards, eg, QCA
Recovery : 3 digested BL plus 3 digested standards in duplicate, eg, R1
Drift : BL plus 1 undigested standard

MODIFICATIONS:

15/08/83 - Microcomputer system was introduced. At this time the calibration technique was changed from linear interpolation to the use of a quadratic.

NOTES:

System is calibrated with undigested standards, but sample concentrations are adjusted to reflect day's value for digested blank.

NITROGEN-TOTAL KJELDAHL
QUALITY CONTROL DATA FROM 03/01/85 TO 23/12/85

Lab: Rivers and Lakes

Analytical Range: 0.06 to 2.00 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	157	1.50	1.49	-0.01	0.017
b :	157	0.50	0.51	0.01	0.015
a+b :	157	2.00	2.00	0.00	0.027
a-b :	157	1.00	0.98	-0.02	0.019

s.d.(AB): Sw(within run): 0.013 S(between runs): 0.016 S/Sw: 1.19

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.91 to 2.09 for A+B
 0.94 to 1.06 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	155	1.40	1.37	0.039
r2 :	156	0.84	0.83	0.022
r3 :	156	0.28	0.28	0.011

DUPLICATES:

	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	55	0.00 - 0.20	0.019	14.2
	216	0.20 - 0.50	0.034	10.4
	97	0.50 - 1.00	0.055	8.6
	13	1.00 - 2.00	0.164	12.7
	381	Overall	0.049	N/A

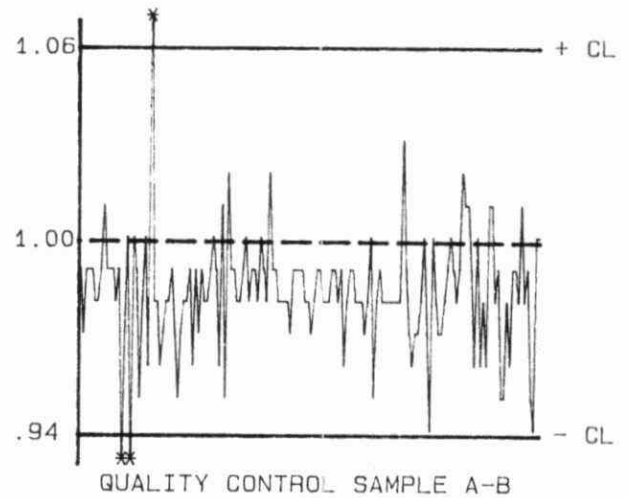
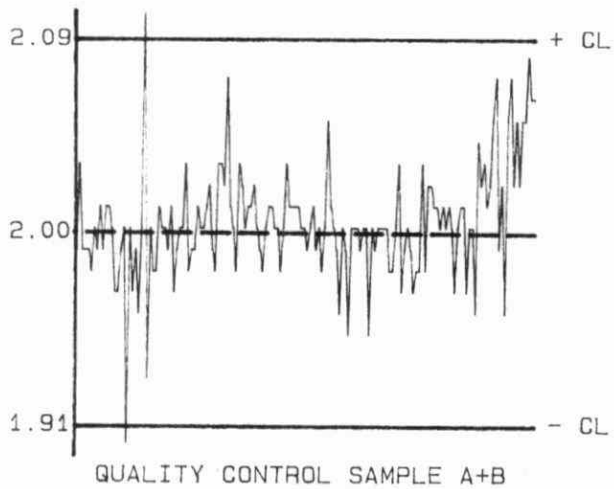
DETECTION CRITERION: 0.06**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	154	0.01	0.009
Digested Blank :	155	0.02	0.008

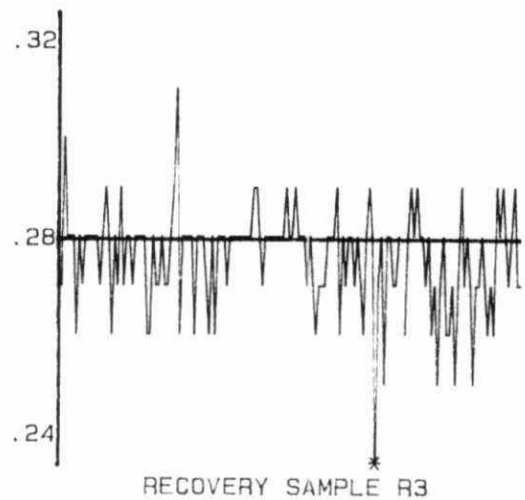
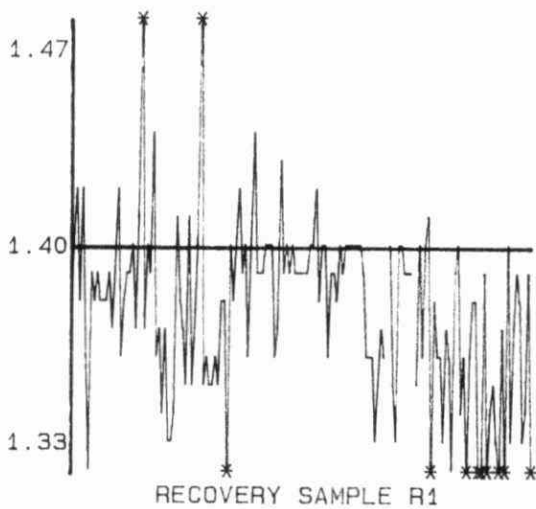
QUALITY CONTROL GRAPHS NITROGEN-TOTAL KJELDAHL (MG/L AS N)

FROM: 03/01/85

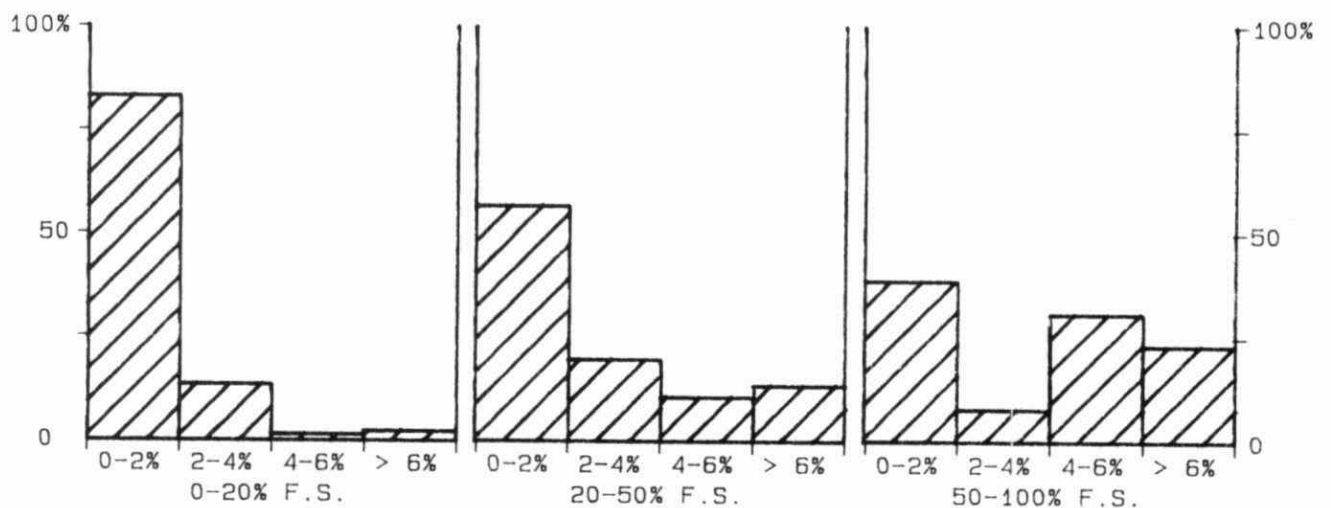
TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS N

*** NITROGEN - TOTAL KJELDAHL ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/79
 LIS Test Name Code: NNTKUR Units : mg/L as N
 Work Station Code : STKNP Unit Code : 064807
 Method Code : 504BC2 Supervisor : P. Campbell
 Sample Type/Matrix: Sewage, Industrial Waste, Domestic Waters, Effluents,
 Leachates

SAMPLING:

Quantity Required: 50 mL
 Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters kept at 200 C and 360 C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst. Approximate absorbance : 0.8 at the 10.0 mg/L as N level.
 N.B. Total phosphorus is determined simultaneously.

INSTRUMENTATION:

-Block digesters(2)
 -Basic automated modular continuous flow system plus 1 module:37 C bath(7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm.

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.05 Detection Criterion (T): 0.19**

CALIBRATION:

BL plus 2 undigested standard

CONTROLS:

Calibration : LTBL plus 4 undigested standards, eg, QCA
 Recovery : 2 digested BL plus 3 digested standards in duplicate, eg, R1
 Drift : BL plus 2 undigested standard

MODIFICATIONS:

01/10/85 -High range added, full scale changed from 10 to 25 mg/L as N. New calibration controls added.

NOTES:

**Minimum dilution is 50% (i.e. factor of two). Therefore actual minimum W and T values are 0.1 and 0.4 respectively.

NITROGEN - TOTAL KJELDAHL
QUALITY CONTROL DATA FROM 03/01/85 TO 31/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.19 to 25.0 mg/L as N

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	40	17.5	17.5	0.0	0.32
b :	40	7.0	7.2	0.2	0.23
a+b :	40	24.5	24.7	0.2	0.52
a-b :	40	10.5	10.4	-0.1	0.19
c :	165	7.00	7.11	0.11	0.120
d :	165	1.40	1.47	0.07	0.054
c+d :	165	8.40	8.58	0.18	0.152
c-d :	165	5.60	5.64	0.04	0.107

s.d.(AB): Sw(within run): 0.13 S(between runs): 0.28 S/Sw: 2.07
 s.d.(CD): Sw(within run): 0.076 S(between runs): 0.093 S/Sw: 1.23

On any given day the calibration is accepted if the values obtained lie within the ranges:

23.4 to 25.6 for A+B
 9.8 to 11.2 for A-B
 7.95 to 8.85 for C+D
 5.30 to 5.90 for C-D

RECOVERIES:	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	130	17.5	17.3	0.51
r2 :	151	7.00	6.93	0.192
r3 :	151	3.50	3.51	0.127

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	249	0.00 - 1.00	0.063	17.5
	34	1.00 - 2.00	0.061	4.4
	46	2.00 - 5.00	0.149	4.2
	26	5.0 - 10.0	0.19	2.8
	8	10.0 - 25.0	0.37	2.4
	363	Overall	0.11	N/A

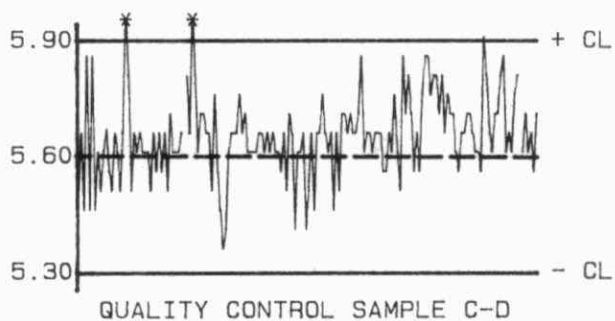
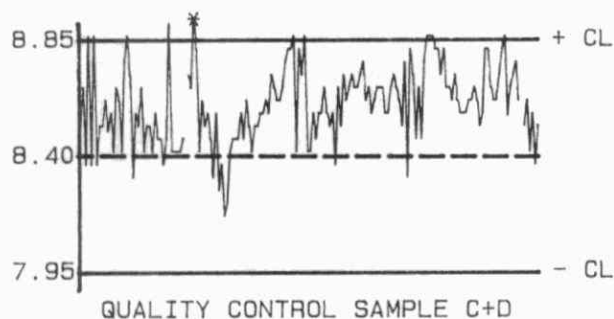
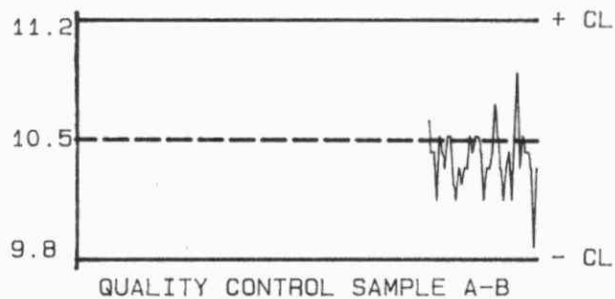
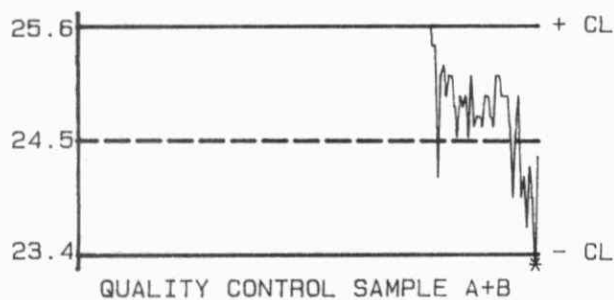
DETECTION CRITERION: 0.19

OTHER CHECKS:	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal :	143	181	34.8
Long Term Blank :	155	0.05	0.010
Digested Blank :	132	0.05	0.013

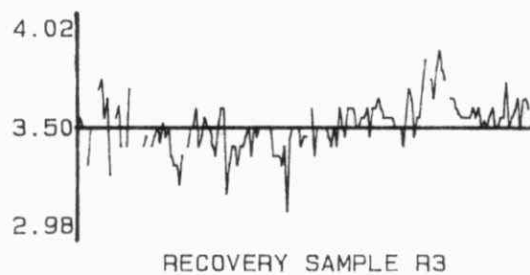
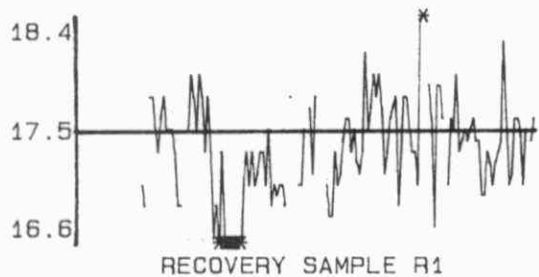
QUALITY CONTROL GRAPHS NITROGEN - TOTAL KJELDAHL (MG/L AS N)

FROM: 03/01/85

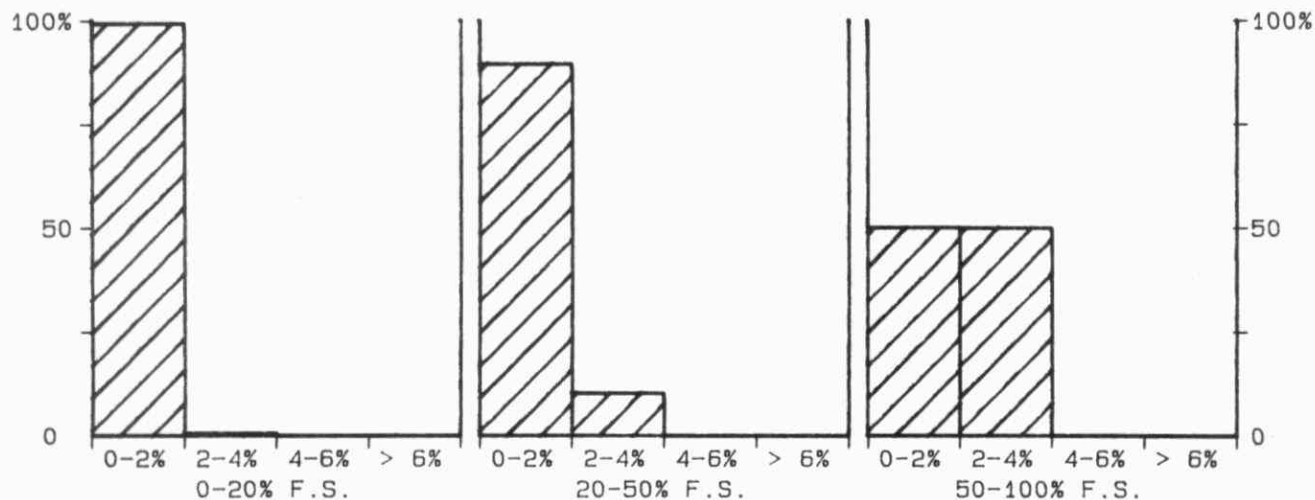
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	BOD5	Units	: mg/L as O
Work Station Code	: R5DBOD	Unit Code	: 064808
Method Code	: 101A12	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Effluents			

SAMPLING:

Quantity Required: 400 mL
 Container : Glass or plastic

SAMPLE PREPARATION:

If necessary sample pH is adjusted to neutral and chlorine is removed by reaction with sodium sulphite.

ANALYTICAL PROCEDURE:

Using dissolved oxygen (DO) analyses, samples are measured for oxygen depletion after a five day period (BOD5) of storage in the dark at 20 C. If necessary dilutions are made with aerated, nutrient-enriched water to obtain a 50-75% oxygen depletion. If the sample has undergone any of the sample preparation steps listed above or if the sample is an industrial waste, a sewage seed is added. For such samples calculation of an appropriate seed correction is required.

INSTRUMENTATION:

- Weston and Stack Oxygen analyzer plus DO probe equipped with stirrer and fitted with a Teflon membrane of 0.5 mil thickness which is permeable to oxygen.
- Titration equipment for Winkler analysis of dissolved oxygen
- Incubator(19-21 C); BOD bottles(300mL)

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W): 0.01

Detection Criterion (T): 0.67

CALIBRATION(DO):

Blank is a sulphite solution (negligible DO) and the standard is air-saturated distilled water. The DO content of the latter is read from a table after measuring its temperature and the barometric pressure in the laboratory.

CONTROLS:

Calibration(DO): 2 "solutions" of distilled water which have been partially stripped of DO by flushing with nitrogen. These "solutions", of different but unknown DO, are analyzed with the DO probe and by the Winkler titration procedure. The difference between the values for the two analytical methods is utilized as a slope control for the DO probe.

Recovery(BOD5): 2 BL plus 3 standards, eg, R1; the expected BOD5 is 67% of the oxygen requirement for complete oxidation.

Drift(DO) : Air saturated distilled water after every 20 samples.

MODIFICATIONS

01/07/82 -Quality control program for DO was expanded, and the use of standard 300 mL BOD bottles was restored.

01/09/85 -BOD test transferred to Sewage/Industrial laboratory to provide consistent QC and improve productivity. No data summary is available for period not covered in performance report.

OXYGEN -BIOCHEMICAL DEMAND
QUALITY CONTROL DATA FROM 18/01/85 TO 28/08/85

Lab: Rivers and Lakes

Analytical Range: 0.67 to 20.0 mg/L as O

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	59	0.00	0.19	0.19	0.142
b :	59	0.00	0.17	0.17	0.124

On any given day the calibration is accepted if the values obtained for A and B lie within the range:

-0.50 to 0.50

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	31	4.34	4.45	0.397
r2 :	31	2.17	2.38	0.312

DUPLICATES:

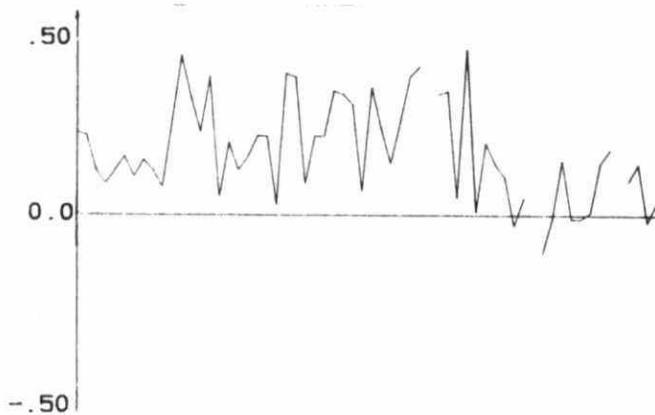
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
70	0.00 - 2.00	0.222	22.7
12	2.00 - 10.00	0.164	4.7
0	10.0 - 20.0	N/A	N/A
82	Overall	0.21	N/A

DETECTION CRITERION: 0.67**OTHER CHECKS:**

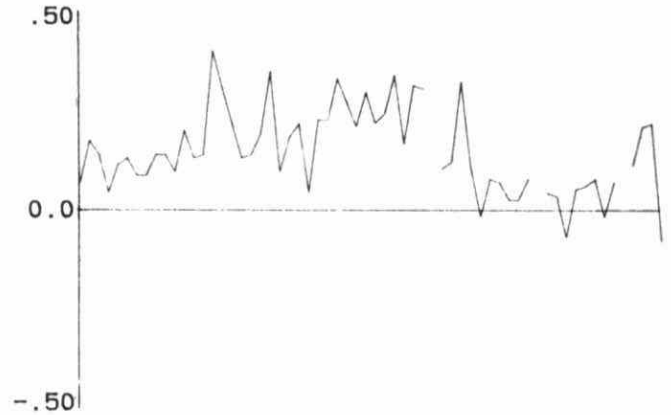
	Number of Data	Data Mean	Standard(1) Deviation
5 day BOD Blank :	29	0.17	0.122

QUALITY CONTROL GRAPHS OXYGEN -BIOCHEMICAL DEMAND (MG/L AS O)

FROM: 18/01/85
TO: 28/08/85

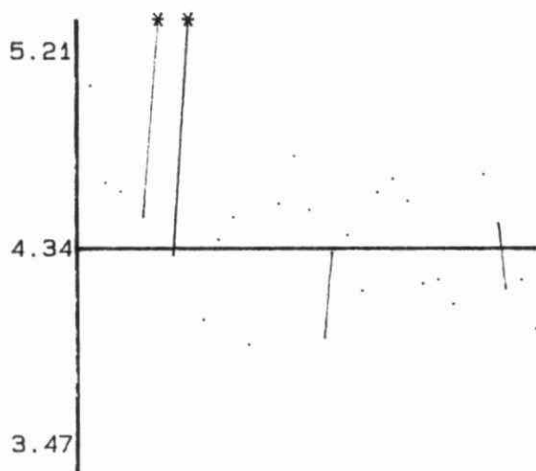


QUALITY CONTROL SAMPLE A

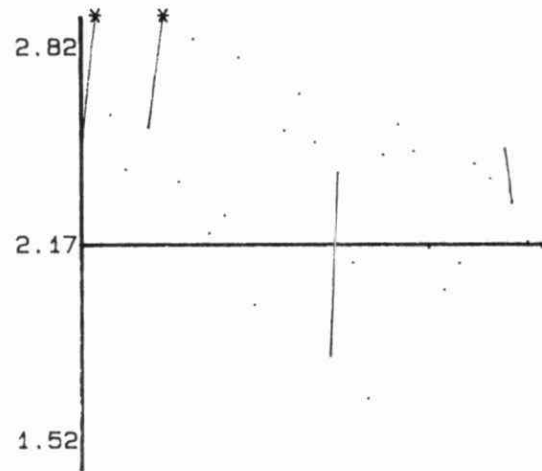


QUALITY CONTROL SAMPLE B

--- EXPECTED VALUE
— CONTROL LIMIT (CL)

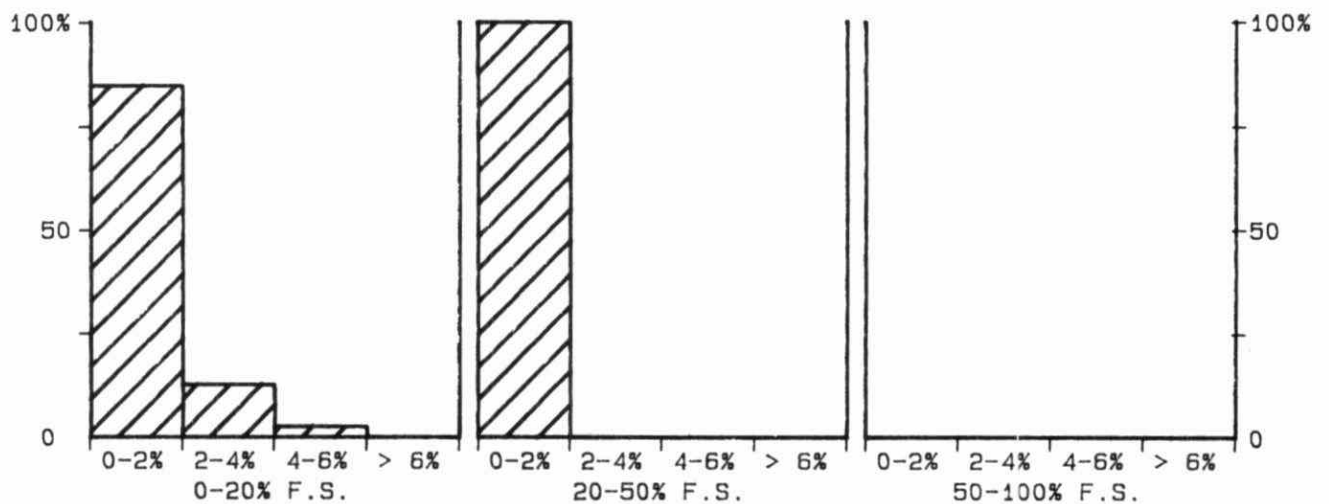


RECOVERY SAMPLE R1



RECOVERY SAMPLE R2

* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 MG/L AS O

*** OXYGEN - BIOCHEMICAL DEMAND ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: Before '61
 LIS Test Name Code: BOD5 Units : mg/L as O
 Work Station Code : SBBOD5 Unit Code : 064808
 Method Code : 101A12 Supervisor : P. Campbell
 Sample Type/Matrix: Sewage, Industrial Waste, Effluents, Domestic Waters,
 Leachates

SAMPLING:

Quantity Required: 400 mL
 Container : Glass or plastic

SAMPLE PREPARATION:

If necessary sample pH is adjusted to neutral and chlorine is removed by reaction with sodium sulphite.

ANALYTICAL PROCEDURE:

Using dissolved oxygen (DO) analyses, samples are measured for oxygen depletion after a five day period (BOD5) of storage in the dark at 20C. If necessary dilutions are made with aerated, nutrient-enriched water to obtain a 50-75% oxygen depletion. If the sample has undergone any of the sample preparation steps listed above or if the sample is an industrial waste, a sewage seed is added. For such samples calculation of an appropriate seed correction is required.

INSTRUMENTATION:

- Weston and Stack Oxygen analyzer plus DO probe equipped with stirrer and fitted with a Teflon membrane of 0.5 mil thickness which is permeable to oxygen.
- Titration equipment for Winkler analysis of dissolved oxygen
- Incubator(19-21 C); BOD bottles (300mL)

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.01 Detection Criterion (T): 1.0

CALIBRATION(DO):

Blank is a sulphite solution(negligible DO) and the standard is air-saturated distilled, deionized water. The DO content of the latter is read from a table after measuring its temperature and the barometric pressure in the laboratory.

CONTROLS:

Calibration(DO): 2 "solutions" of distilled water which have been partially stripped of DO by flushing with nitrogen. These "solutions", of different but unknown DO, are analyzed with the DO probe and by the Winkler titration procedure. The difference between the values for the two analytical methods is utilized as a slope control for the DO probe.

Recovery(BOD5): 2 BL plus 3 standards, eg, R1; the expected BOD5 is 67% of the oxygen requirement for complete oxidation.

Drift(DO) : Air saturated distilled water after every 24 samples.

MODIFICATIONS

01/05/81 -Quality control program for DO was expanded, and the use of standard 300 mL BOD bottles was restored.

25/06/84 -Digital burette (readability to 0.01mL) replaced glass burette.

OXYGEN DEMAND - BIOCHEMICAL
QUALITY CONTROL DATA FROM 02/01/85 TO 19/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 1.0 to 400 mg/L as O

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	175	0.00	0.00	0.00	0.092
b :	175	0.00	-0.01	-0.01	0.074

On any given day the calibration is accepted if the values obtained for A and B lie within the range:

-0.25 to 0.25

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	80	2.17	2.11	0.128
r2 :	79	4.34	4.21	0.157
r3 :	80	6.52	6.35	0.159

DUPLICATES:

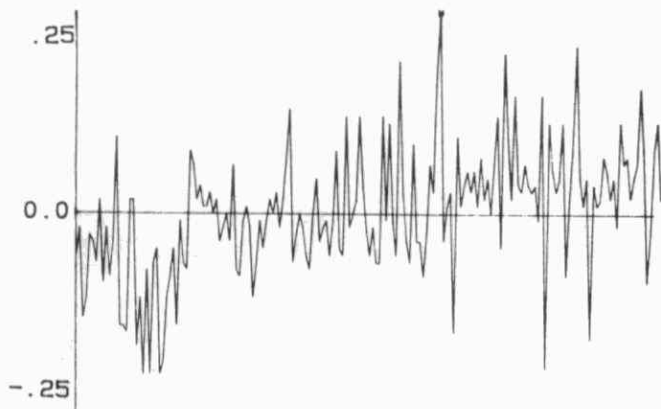
	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	9	0.0 - 5.0	0.33	13.0
	24	5 - 20	1.4	11.0
	39	20 - 50	3.3	9.5
	41	50 - 100	5.2	6.9
	59	100 - 400	12.5	7.3
	172	Overall	7.9	N/A

DETECTION CRITERION: 1.0**OTHER CHECKS:**

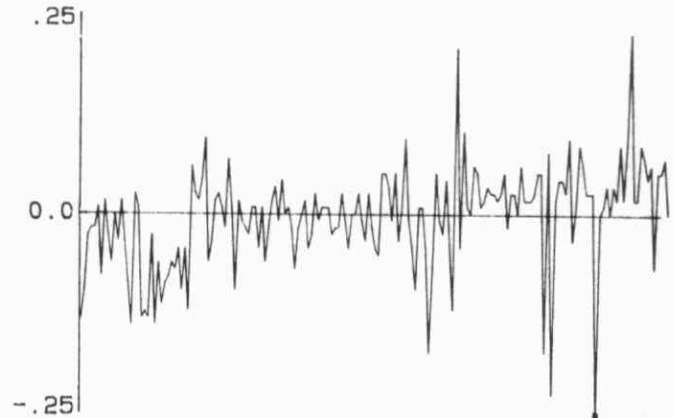
	Number of Data	Data Mean	Standard(1) Deviation
5 day DDW Blank :	89	0.16	0.090
5 day BOD Blank :	88	0.15	0.109

QUALITY CONTROL GRAPHS OXYGEN DEMAND - BIOCHEMICAL (MG/L AS O)

FROM: 02/01/85
TO: 19/12/85

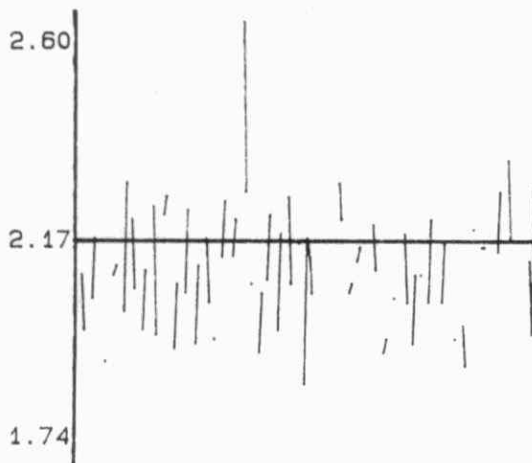


QUALITY CONTROL SAMPLE A

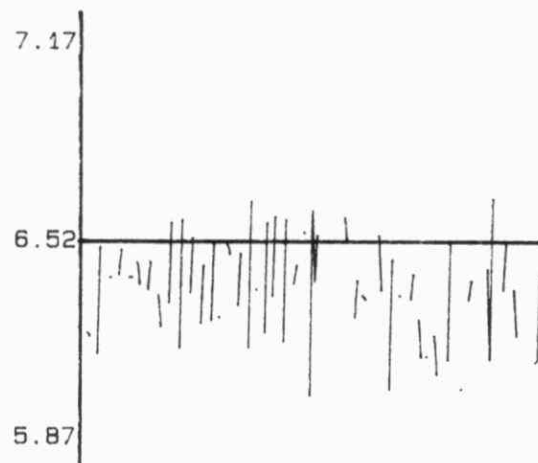


QUALITY CONTROL SAMPLE B

--- EXPECTED VALUE
— CONTROL LIMIT (CL)

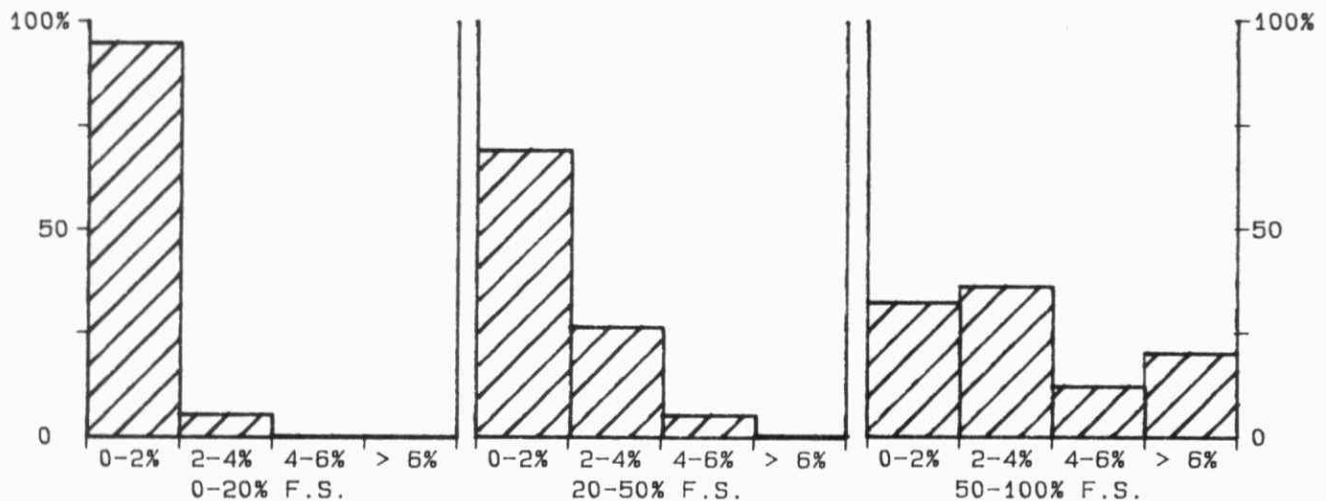


RECOVERY SAMPLE R1



RECOVERY SAMPLE R3

* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 400 MG/L AS O

*** OXYGEN - CHEMICAL DEMAND ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/07/82
LIS Test Name Code:	COD	Units	: mg/L as O
Work Station Code	: RCOO	Unit Code	: 064808
Method Code	: 002AC0	Supervisor	: J. Crouther
Sample Type/Matrix: Rivers, Lakes, Effluents			

SAMPLING:

Quantity Required: 25 mL
Container : Glass

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 150 C. Analysis is completed by automated colourimetric measurement of trivalent chromium.

Approximate absorbance: 0.6 at the 500 mg/L level.

INSTRUMENTATION:

Culture tubes with Teflon closures; mechanical-convection oven
-Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 1 Detection Criterion (T): 2

CALIBRATION:

2 digested BL plus 3 digested standards

CONTROLS:

Calibration : 2 digested standards, eg, QCA
Recovery : 2 digested standards, eg, R1
Drift : Undigested BL: 1 per 9 samples
Interference: Digested standard (40 mg/L as O) spiked with 50 mg/L Cl confirms suppression of chloride interference.

MODIFICATIONS:

30/06/82- Manual COD procedure described in HAMES was discontinued. Development report on the current procedure, described above, is available on request.

NOTES:

-In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week.
-Chemical oxygen demand analyses for Rivers and Lakes' samples are set up in the latter laboratory, but completed in the Sewage/Industrial laboratory. Thus the following performance data report only refers to duplicate results. Please consult the Sewage/Industrial report for the remaining QC data.

OXYGEN - CHEMICAL DEMAND
QUALITY CONTROL DATA FROM 10/01/85 TO 13/12/85

Lab: Rivers and Lakes

Analytical Range: 2 to 100 mg/L as O

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	43	40.0	39.3	-0.7	1.02
b :	43	10.0	9.6	-0.4	1.33
a+b :	43	50.0	48.9	-1.1	1.52
a-b :	43	30.0	29.7	-0.3	1.81

s.d.(AB): Sw(within run): 1.28 S(between runs): 1.19 S/Sw: 0.93

On any given day the calibration is accepted if the values obtained lie within the ranges:

47.0 to 53.0 for A+B
 28.0 to 32.0 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	41	40.0	36.3	3.06
r2 :	42	10.0	8.7	1.97

DUPLICATES:

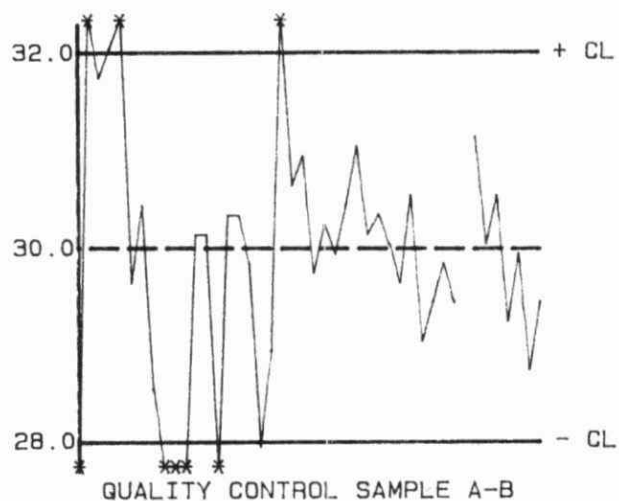
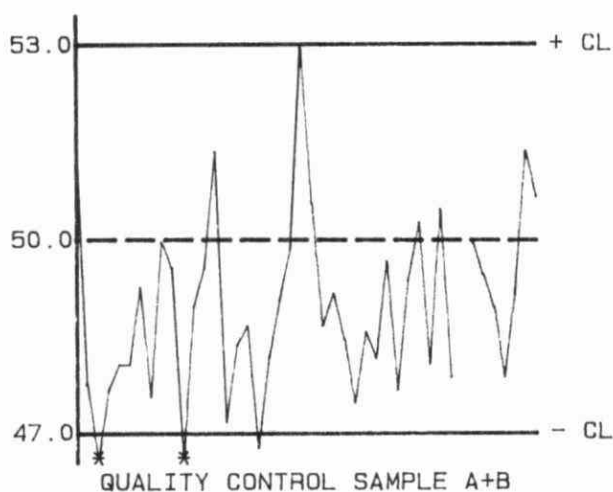
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
13	0 - 10	0.5	7.8
60	10 - 25	1.6	9.5
17	25 - 50	3.3	10.4
4	50 - 100	0.3	0.6
94	Overall	1.9	N/A

DETECTION CRITERION: 2**OTHER CHECKS:**

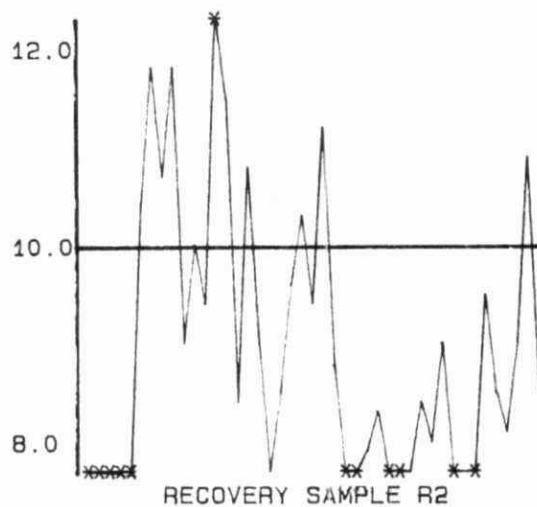
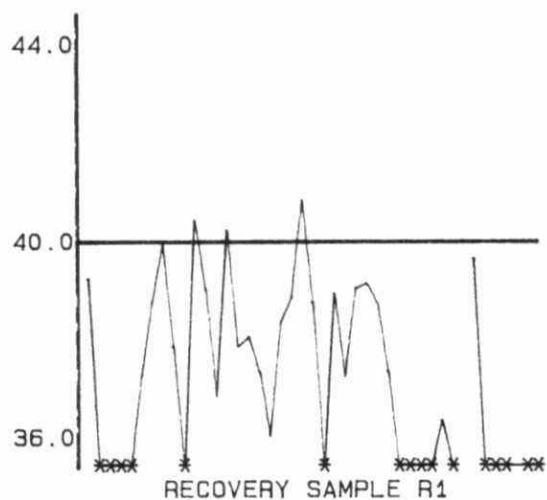
	Number of Data	Data Mean	Standard(1) Deviation
Std Cal :	21	484.1	80.2
Chloride Int. :	21	39.6	1.41
Digested Blank :	41	3.8	2.34

QUALITY CONTROL GRAPHS OXYGEN - CHEMICAL DEMAND (MG/L AS O)

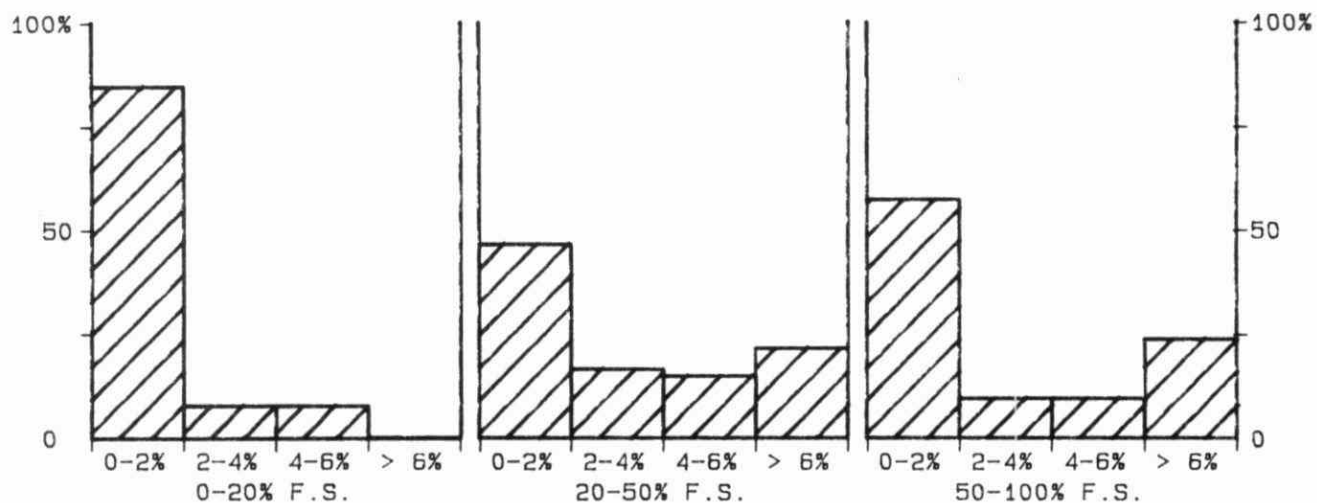
FROM: 10/01/85
TO: 13/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 MG/L AS O

*** OXYGEN - CHEMICAL DEMAND ***

IDENTIFICATION:

Laboratory	: Sewage/Industrial	Method Introduced:	01/07/82
LIS Test Name Code:	COD	Units	: mg/L as O
Work Station Code	: SBCOD	Unit Code	: 064808
Method Code	: 002AC0	Supervisor	: P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Domestic Waters, Leachates, Effluents			

SAMPLING:

Quantity Required: 25 mL
Container : Glass

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 150 C. Analysis is completed by automated colourimetric measurement of trivalent chromium.

Approximate absorbance: 0.6 at the 500 mg/L level.

INSTRUMENTATION:

Culture tubes with Teflon closures; mechanical-convection oven
-Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 1 Detection Criterion (T): 13

CALIBRATION:

2 digested BL plus 4 digested standards

CONTROLS:

Calibration : 2 digested standards, eg, QCA
Recovery : 2 digested standards, eg, R1
 1 digested blank per 9 samples
Drift : 1 undigested BL per 9 samples
Interference: Digested standard (50 mg/L as O) spiked to 900 mg/L Cl confirms suppression of chloride interference.

MODIFICATIONS:

30/06/82- Manual COD procedure described in HAMES was discontinued. Development report on the current procedure, described above, is available on request.

NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis are scheduled for completion within the week.

OXYGEN DEMAND - CHEMICAL
QUALITY CONTROL DATA FROM 09/01/85 TO 17/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 13 to 500 mg/L as O

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	57	400	397	-3	13.1
b :	57	100	101	1	6.8
a+b :	57	500	498	-2	18.3
a-b :	57	300	296	-4	10.2

s.d.(AB): Sw(within run): 7.2 S(between runs): 10.4 S/Sw: 1.45

On any given day the calibration is accepted if the values obtained lie within the ranges:

463 to 537 for A+B
 275 to 325 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	57	400	387	10.9
r2 :	55	100	98	5.9

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
20	0 - 50	4.4	33.8
4	50 - 100	2.0	2.8
8	100 - 250	15.1	9.2
4	250 - 500	6.9	2.1
36	Overall	8.2	N/A

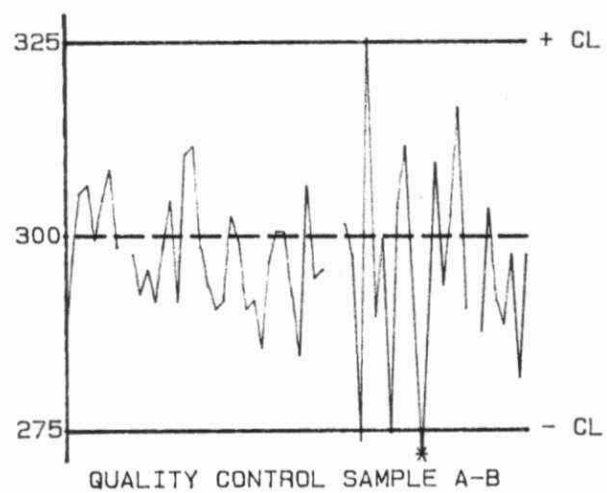
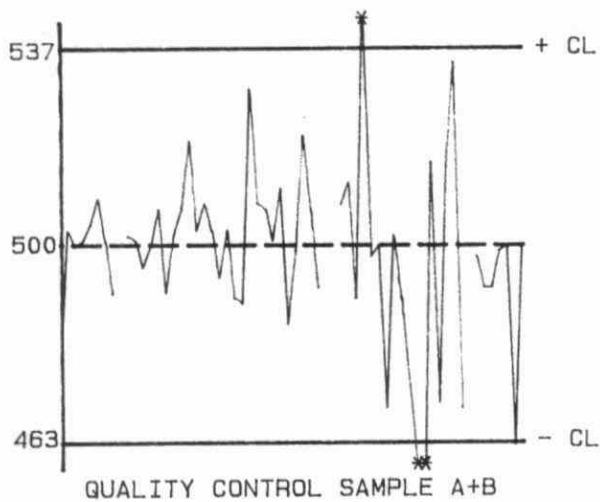
DETECTION CRITERION: 13**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal :	50	246	17.1
Chloride Check :	56	57	7.9
Digested Blank :	58	41	9.8

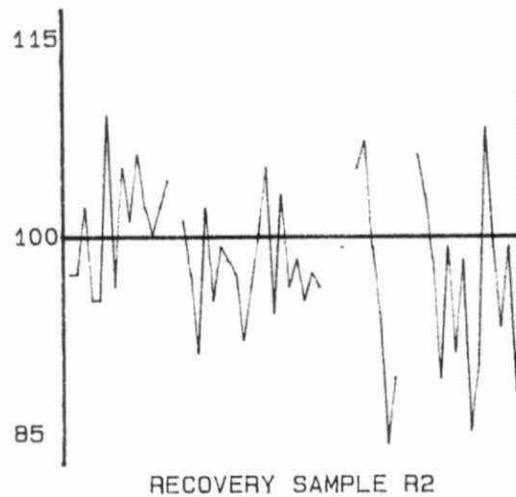
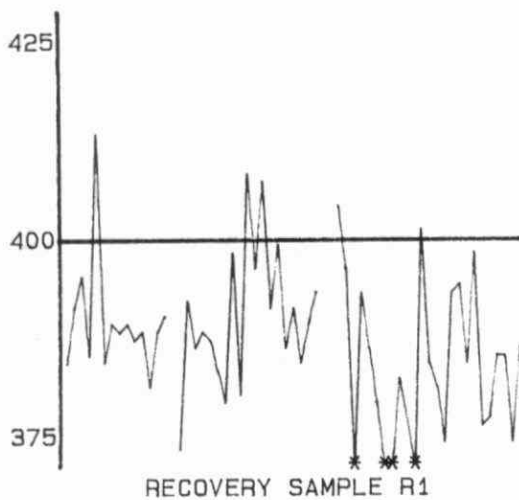
QUALITY CONTROL GRAPHS OXYGEN DEMAND - CHEMICAL (MG/L AS O)

FROM: 09/01/85

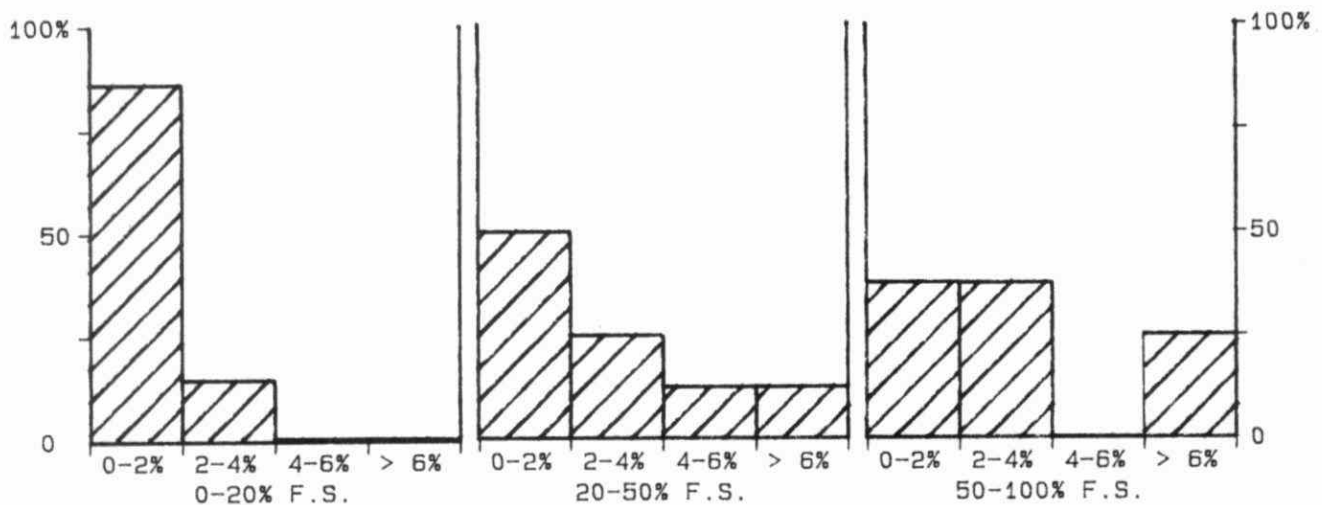
TO: 17/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 500 MG/L AS O

*** PH ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	Before '60
LIS Test Name Code:	PH	Units	: Dimensionless
Work Station Code	: WPC	Unit Code	: Nil
Method Code	: 001A11	Supervisor	: M. Rawlings
Sample Type/Matrix:	Domestic Waters, Leachates, Effluents		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample at room temperature. Stirring rate, and room temperature range are uniform for all samples and standards.

INSTRUMENTATION:

pH meter, stirrer, glass electrode

REPORTING:

Maximum Significant Figures:	3	
Minimum Increment (W) :	0.01	Detection Criterion (T): N/A

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9.

CONTROLS:

Calibration : 2 buffers

PH
QUALITY CONTROL DATA FROM 03/01/85 TO 30/12/85

Lab: Domestic Water

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	170	8.50	8.53	0.03	0.033
b :	170	6.20	6.19	-0.01	0.024
a+b :	170	14.70	14.72	0.02	0.047
a-b :	170	2.30	2.33	0.03	0.035

s.d.(AB): Sw(within run): 0.025 S(between runs): 0.029 S/Sw: 1.17

On any given day the calibration is accepted if the values obtained lie within the ranges:

14.49 to 14.91 for A+B
2.16 to 2.44 for A-B

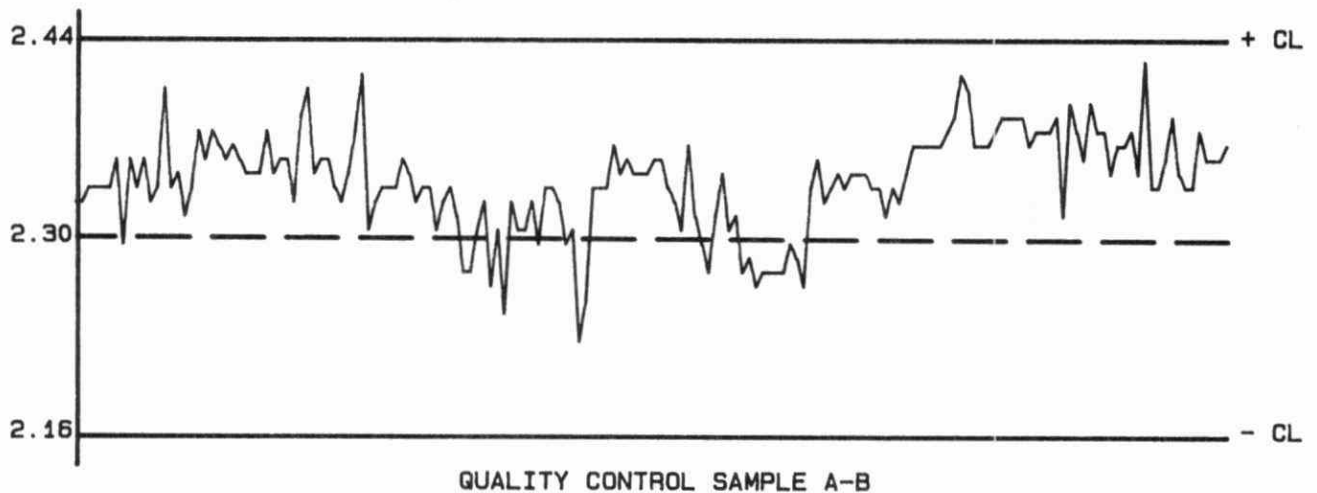
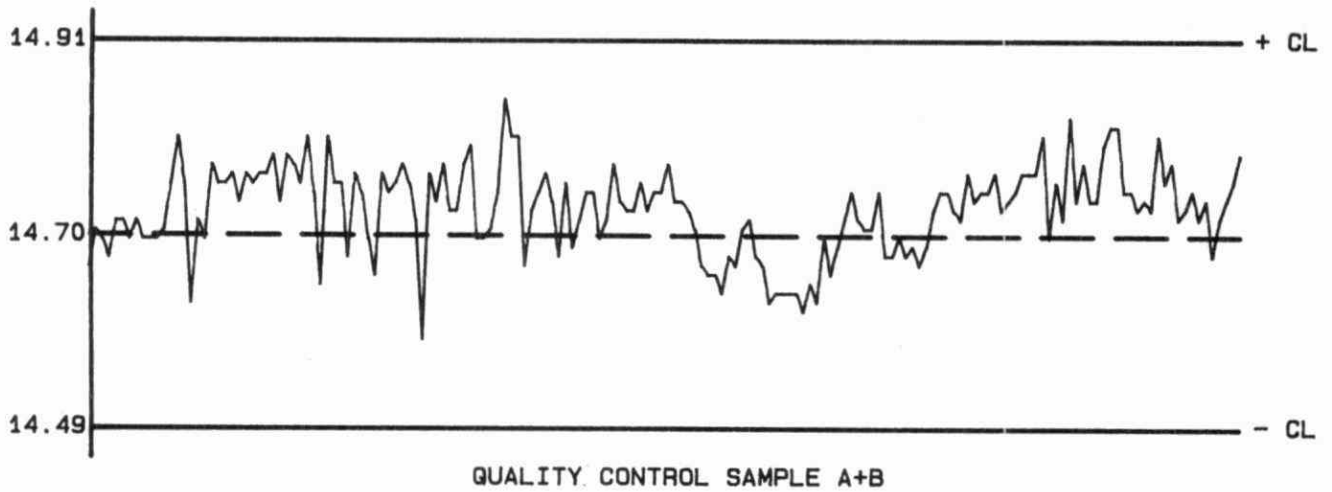
DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
7	0.00 - 6.00	0.019	0.3
27	6.00 - 7.00	0.034	0.5
260	7.00 - 8.00	0.039	0.5
90	8.00 - 9.00	0.030	0.3
4	9.00 - 14.00	0.033	0.3
388	Overall	0.036	N/A

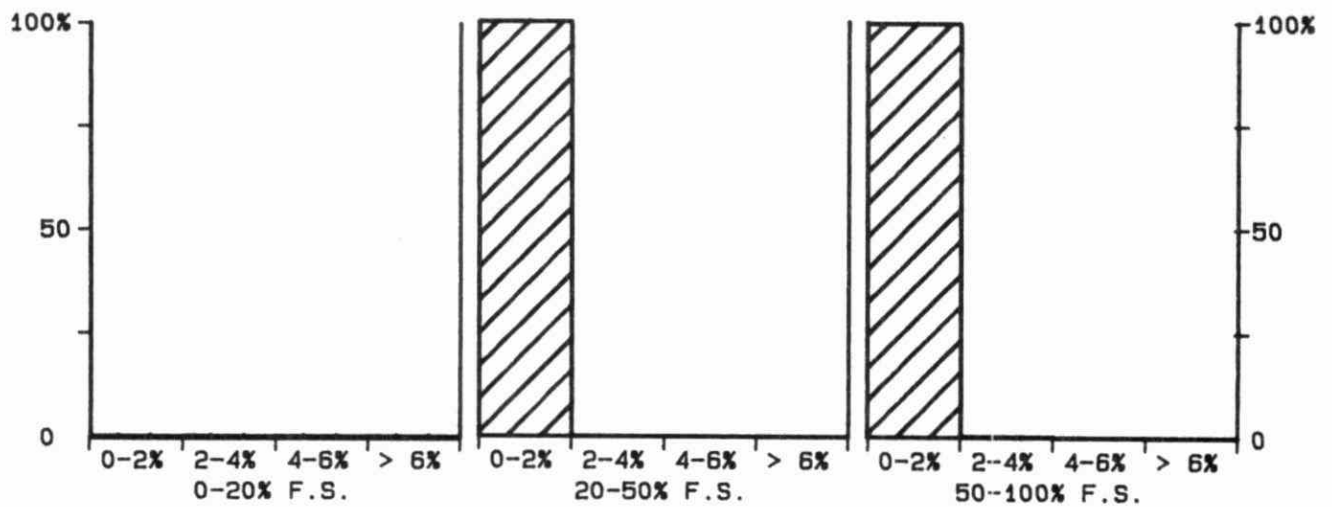
QUALITY CONTROL GRAPHS

PH

FROM: 03/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 14

*** PH ***

IDENTIFICATION:

Laboratory : Dorset Method Introduced: 01/06/76
Supervisor : F. Tomassini
Sample Type/Matrix: Streams, Lakes, Precipitation

SAMPLING:

Quantity Required: 250 mL
Container : Polyethylene bottle filled to the brim; screw caps with cone-shaped liners

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (100 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.

N.B. Two performance reports follow: in the first, Alkalinity (Gran) was performed simultaneously, the second was a stand-alone pH work station.

INSTRUMENTATION

Semi-automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration: LTBL plus two standards, eg, QCA
Drift : 2 standard buffers -4 times daily

PH
QUALITY CONTROL DATA FROM 03/01/85 TO 24/12/85

Lab: Dorset

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	211	6.86	6.88	0.02	0.010
b :	211	4.00	4.00	-0.00	0.014
a+b :	211	10.86	10.87	0.01	0.014
a-b :	211	2.86	2.88	0.02	0.020

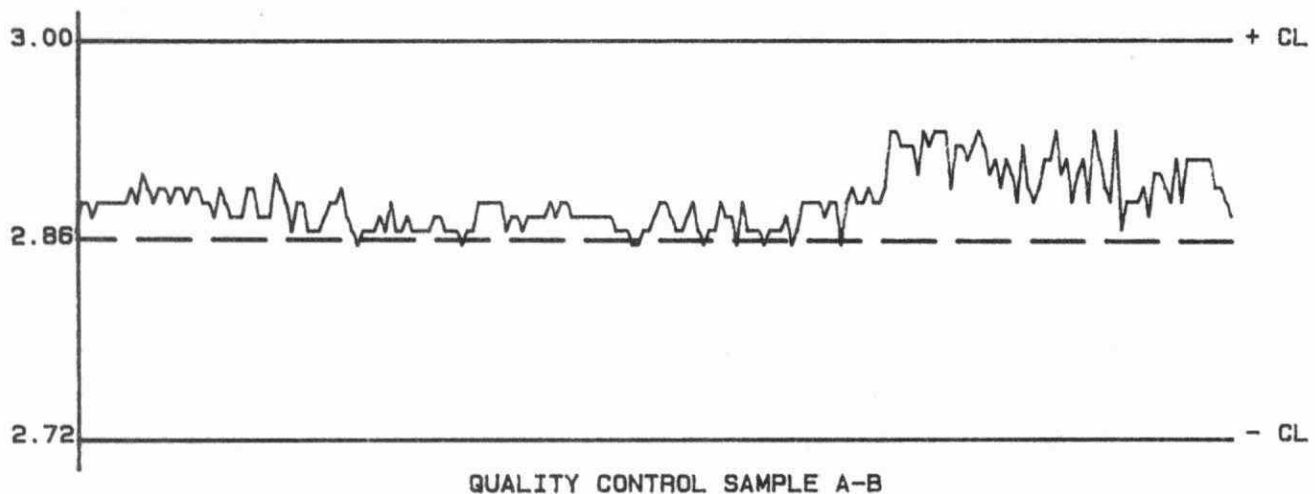
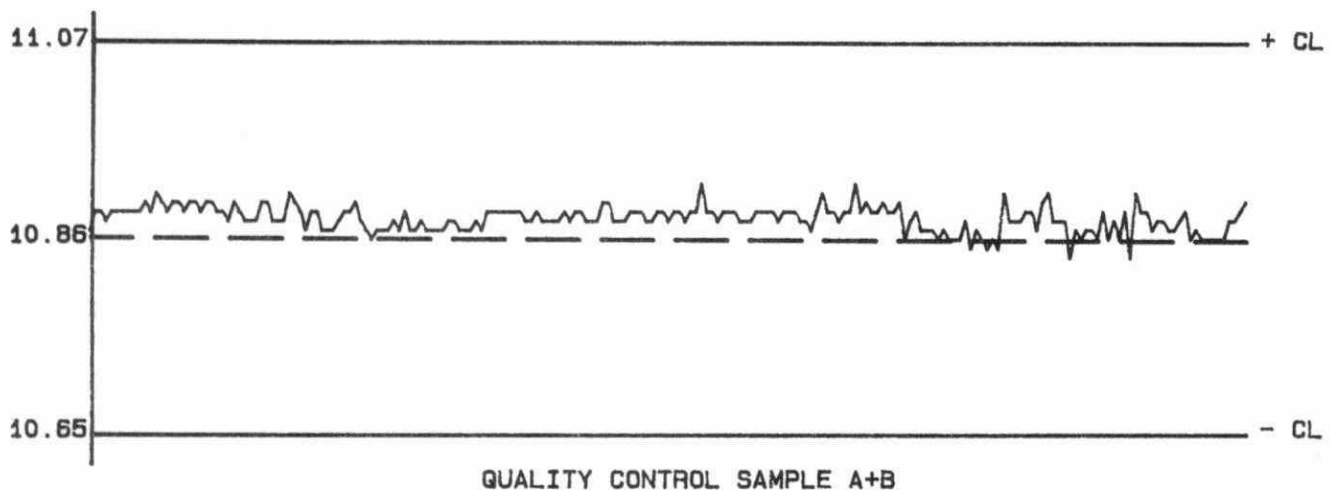
s.d.(AB): Sm(within run): 0.014 S(between runs): 0.012 S/Sm: 0.86

On any given day the calibration is accepted if the values obtained lie within the ranges:

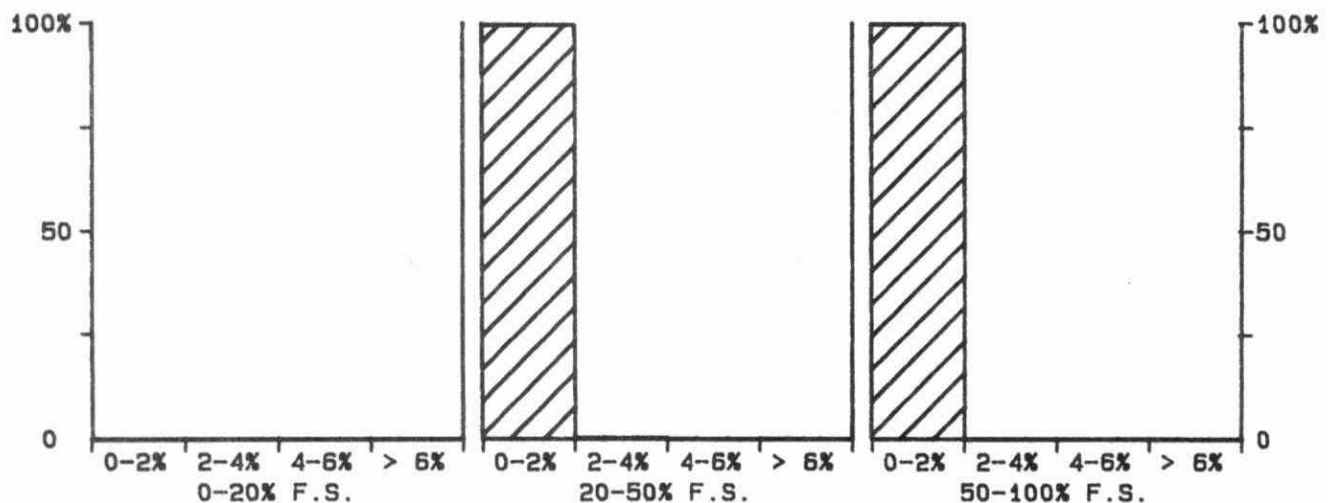
10.65 to 11.07 for A+B
2.72 to 3.00 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
0	0.00 - 4.00	N/A	N/A
109	4.00 - 5.50	0.041	0.8
202	5.50 - 7.00	0.040	0.6
4	7.00 - 8.50	0.019	0.2
0	8.50 - 14.00	N/A	N/A
315	Overall	0.040	N/A

QUALITY CONTROL GRAPHS
PHFROM: 03/01/85
TO: 24/12/85

--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 14

PH
QUALITY CONTROL DATA FROM 24/01/85 TO 19/12/85

Lab: Dorset

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	116	6.86	6.87	0.01	0.012
b :	116	4.00	4.01	0.01	0.012
a+b :	116	10.86	10.88	0.02	0.019
a-b :	116	2.86	2.87	0.01	0.015

s.d.(AB): Sw(within run): 0.011 S(between runs): 0.012 S/Sw: 1.13

On any given day the calibration is accepted if the values obtained lie within the ranges:

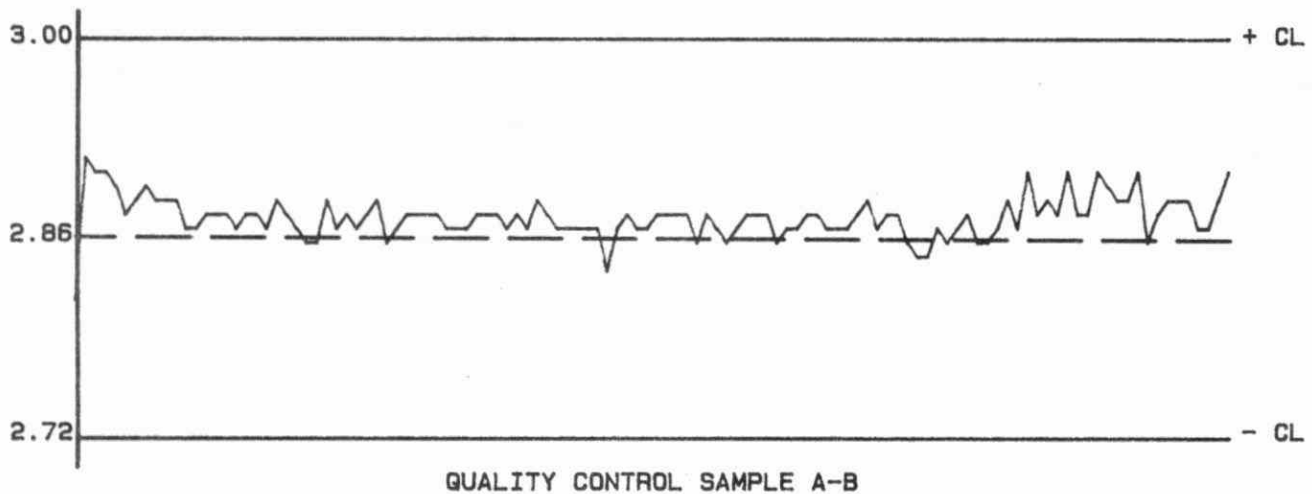
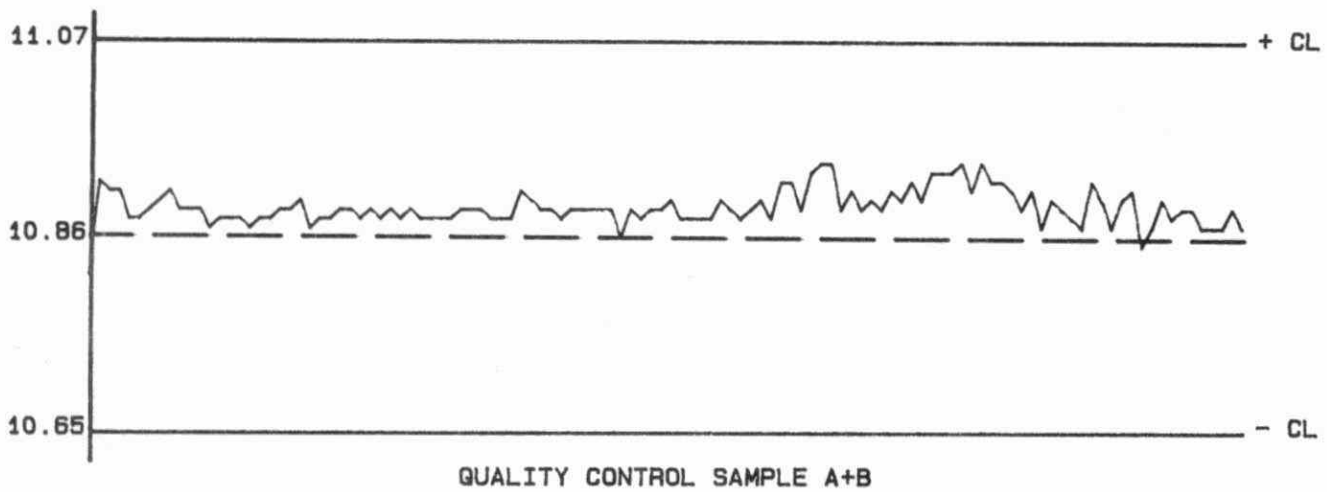
10.65 to 11.07 for A+B
2.72 to 3.00 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	0	0.00 - 4.00	N/A	N/A
	40	4.00 - 5.50	0.014	0.2
	194	5.50 - 7.00	0.025	0.4
	6	7.00 - 8.50	0.033	0.4
	0	8.50 - 14.00	N/A	N/A
	240	Overall	0.024	N/A

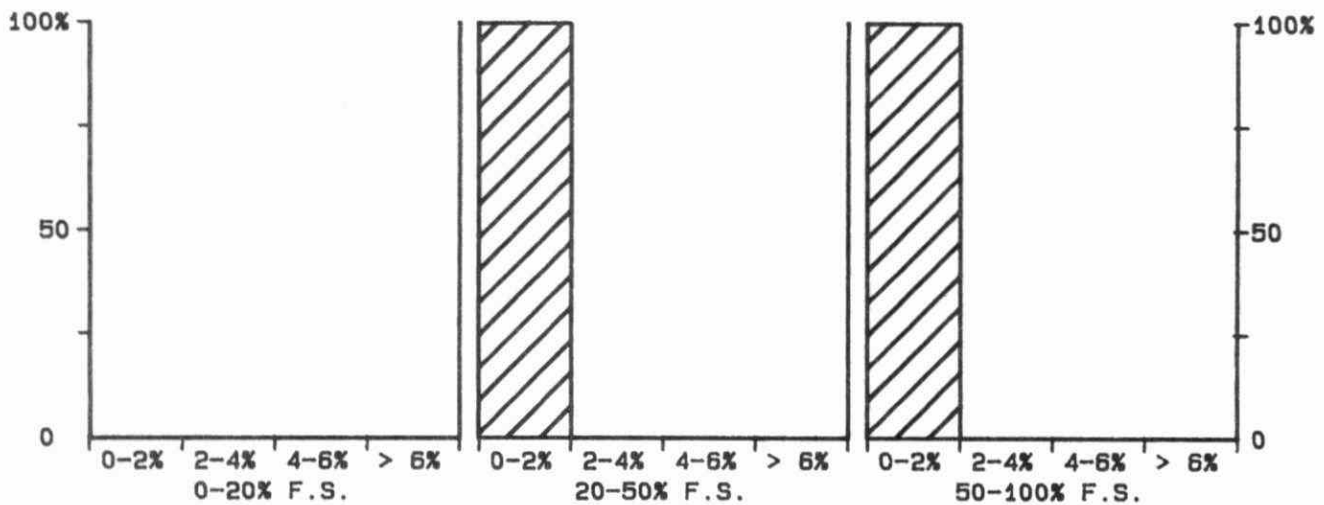
QUALITY CONTROL GRAPHS
PH

FROM: 24/01/85

TO: 19/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 14

*** PH ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/05/79
LIS Test Name Code:	PH	Units	: Dimensionless
Work Station Code	: PHACD	Unit Code	: Nil
Method Code	: 002A11	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow			

SAMPLING:

Quantity Required: 15 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.
N.B. Gran and total fixed endpoint acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration : LTBL plus two standards, eg, QCA

MODIFICATIONS:

01/04/82- Sample volume was decreased from 100.0 to 10.0 mL.
01/05/83- System was fully automated by introduction of a sampler, and an automated device for washing the electrode between analyses.

PH

QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	148	6.86	6.87	0.01	0.008
b :	148	4.01	4.01	-0.00	0.005
a+b :	148	10.87	10.88	0.01	0.012
a-b :	148	2.85	2.86	0.01	0.007

s.d.(AB): Sw(within run): 0.005 S(between runs): 0.007 S/Sw: 1.35

On any given day the calibration is accepted if the values obtained lie within the ranges:

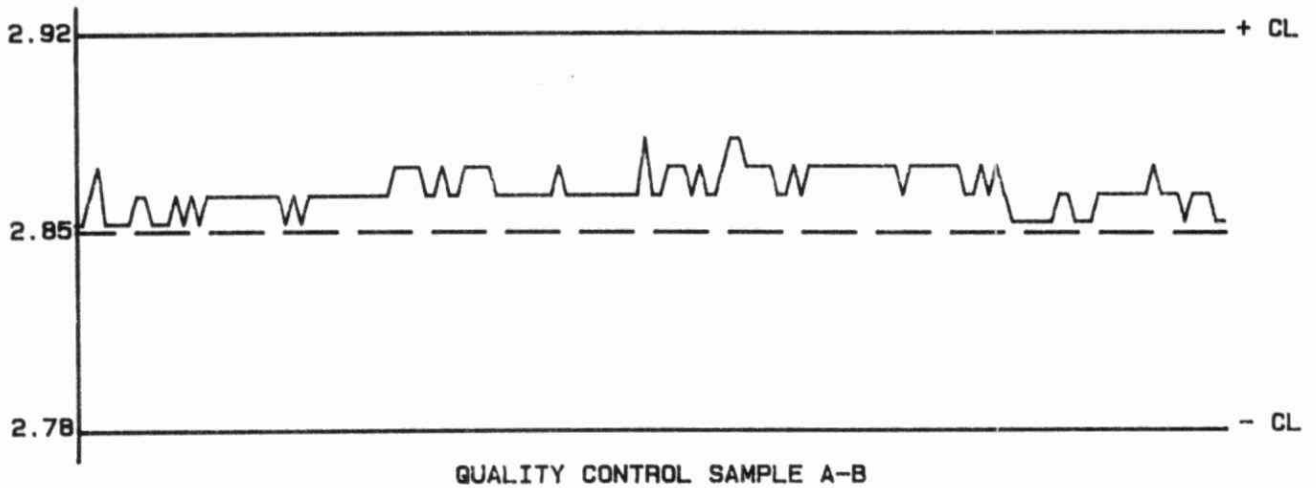
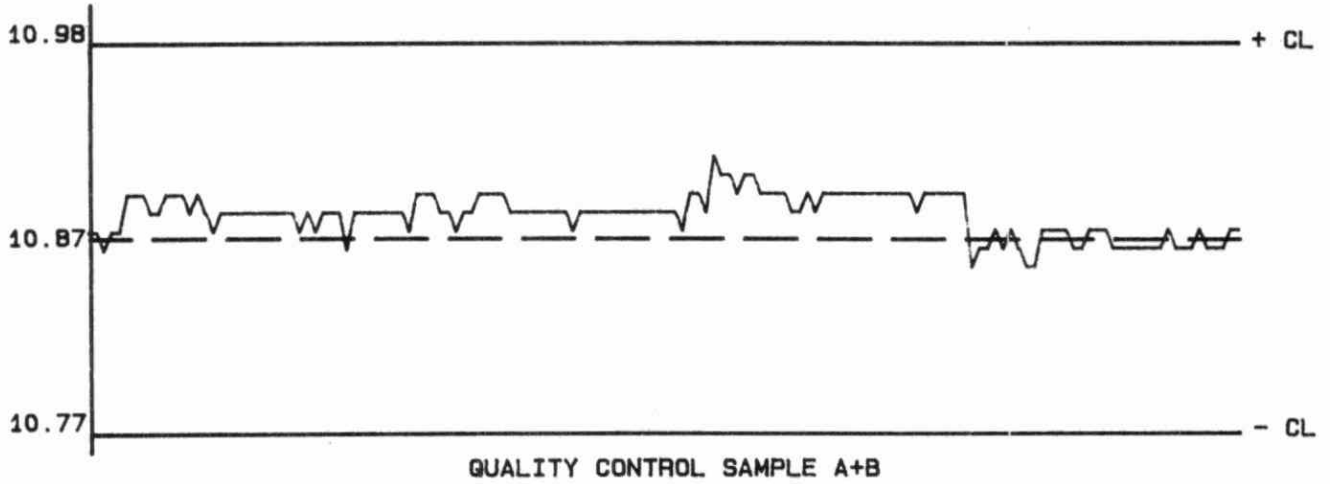
10.76 to 10.97 for A+B
2.78 to 2.92 for A-B

DUPLICATES:

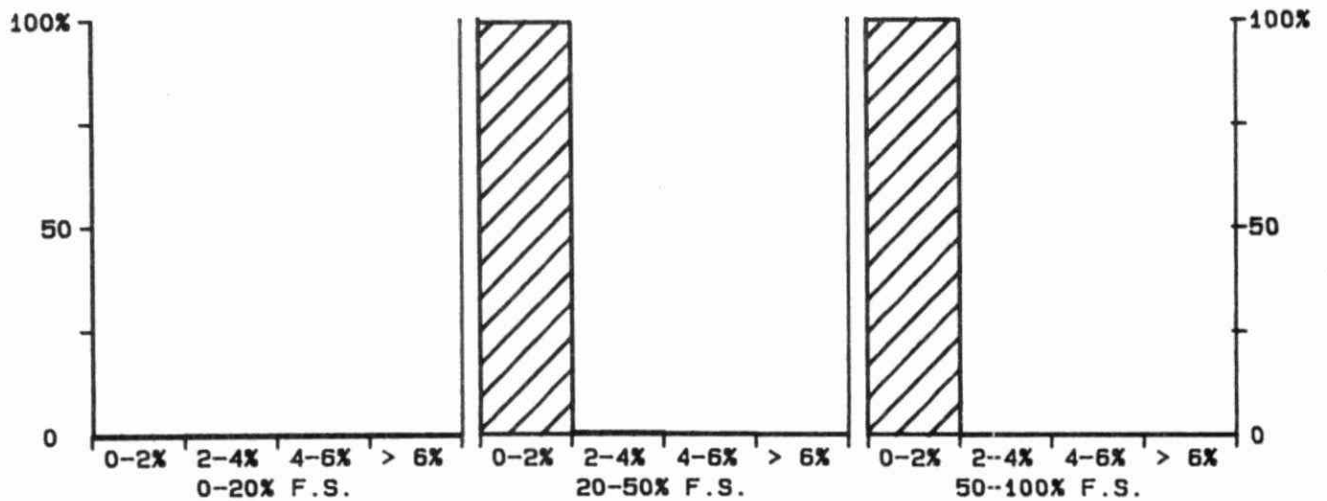
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
0	0.00 - 3.00	N/A	N/A
37	3.00 - 4.00	0.025	0.6
244	4.00 - 5.00	0.027	0.6
88	5.00 - 7.00	0.089	1.5
8	7.00 - 14.00	0.085	1.1
377	Overall	0.051	N/A

QUALITY CONTROL GRAPHS PH

FROM: 02/01/85
TO: 23/12/85



--- EXPECTED VALUE
 --- CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 14

*** PH ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	09/07/80
LIS Test Name Code:	PH	Units	: Dimensionless
Work Station Code	: RATS	Unit Code	: Nil
Method Code	: 003AI2	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic, filled

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.
N.B. Alkalinity (Gran and total fixed endpoint) are determined simultaneously

INSTRUMENTATION:

RATS: Automated titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7.

CONTROLS:

Calibration: LTBL plus two standards, sulfuric acid and sodium carbonate solutions, eg, QCA
Drift : In run standard, 20% tap water - throughout run. Diluted tap water (20 % V/V)

MODIFICATIONS:

02/03/84- QC program at this workstation was expanded to include pH and total fixed endpoint alkalinity. Preparation and storage of QC solutions was modified. As shown by the following QCA-B data, the attempt to check pH calibrations by monitoring the pH values of the dilute alkalinity standards failed. Buffers will be utilized in '85.

16/03/84- Use of 4 oz. polyethylene bottles plus screw caps with cone-shaped liners was recommended for sampling.

09/05/85- RATS- River Automated Titration System. Designed for the determination of conductivity, pH, alkalinity - total fixed endpoint and alkalinity - Gran. The system is microcomputer controlled with data reduction and direct computer (DCI) capabilities.

No data summary is available for period not covered in report.

PH
QUALITY CONTROL DATA FROM 09/05/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	97	4.45	4.47	0.02	0.018
b :	97	3.73	3.72	-0.01	0.027
a+b :	96	8.18	8.20	0.02	0.035
a-b :	96	0.72	0.75	0.03	0.029

s.d.(AB): Sw(within run): 0.021 S(between runs): 0.023 S/Sw: 1.12

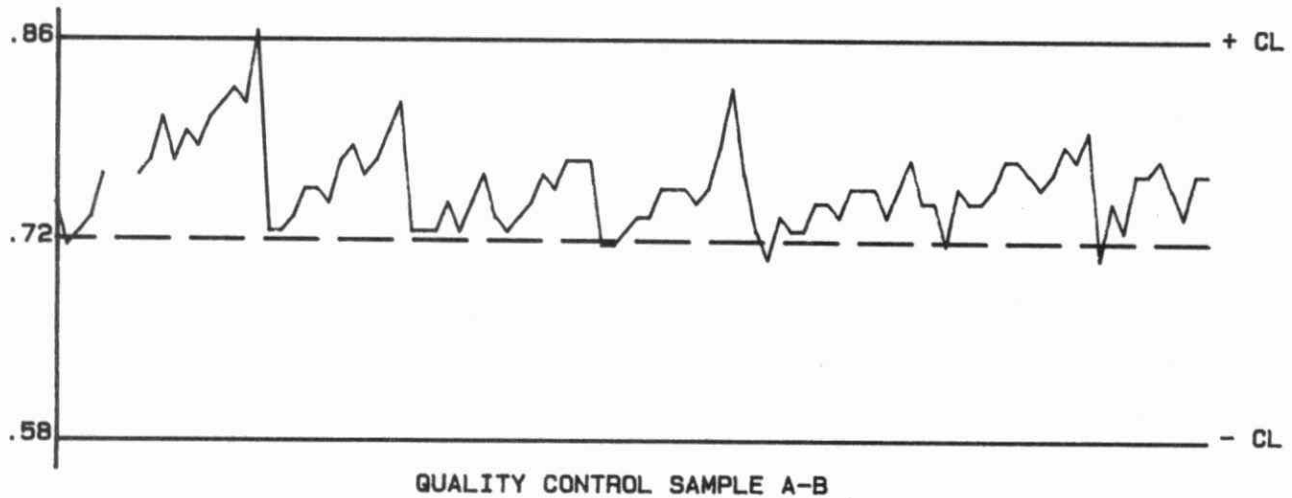
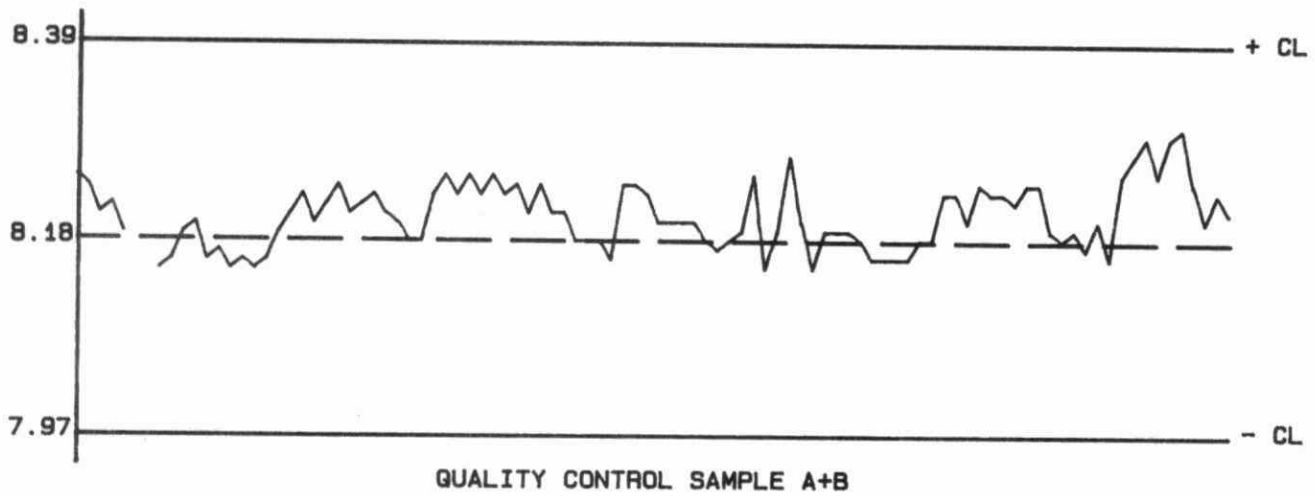
On any given day the calibration is accepted if the values obtained lie within the ranges:

7.97 to 8.39 for A+B
0.58 to 0.86 for A-B

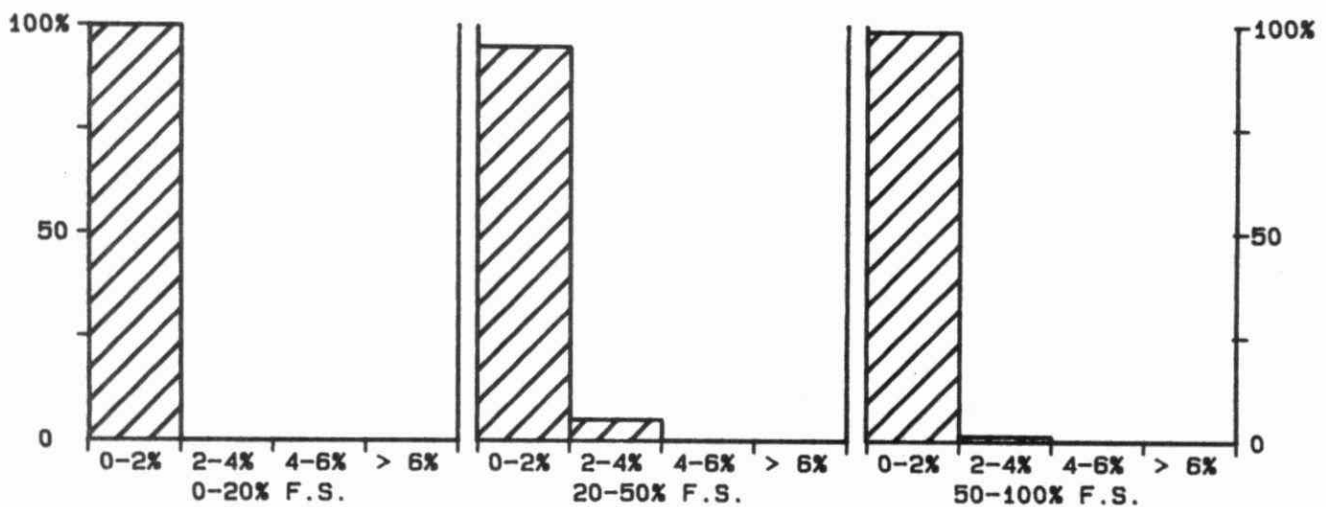
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	9	0.00 - 5.00	0.038	0.9
	13	5.00 - 6.00	0.111	2.0
	38	6.00 - 7.00	0.116	1.7
	211	7.00 - 9.00	0.066	0.8
	9	9.00 - 14.00	0.108	1.0
	280	Overall	0.078	N/A

QUALITY CONTROL GRAPHS PH

FROM: 09/05/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 14

*** PH ***

IDENTIFICATION:

Laboratory	: Sewage/Industrial	Method Introduced:	Before '70
LIS Test Name Code:	PH	Units	: Dimensionless
Work Station Code	: SBPH	Unit Code	: Nil
Method Code	: 001A11	Supervisor	: P. Campbell
Sample Type/Matrix:	Sewage, Industrial Waste, Effluents		

SAMPLING:

Quantity Required: 75 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (50 mL) at room temperature. Stirring rate and room temperature range are uniform for all samples and standards.

INSTRUMENTATION:

pH meter, stirrer, glass electrode

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9.

CONTROLS:

Calibration: 2 standard buffers

PH
QUALITY CONTROL DATA FROM 07/01/85 TO 16/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.00 to 14.00

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	121	9.00	8.98	-0.02	0.037
b :	121	4.00	4.00	0.00	0.022
a+b :	121	13.00	12.98	-0.02	0.045
a-b :	121	5.00	4.98	-0.02	0.041

s.d.(AB): Sw(within run): 0.029 S(between runs): 0.030 S/Sw: 1.05

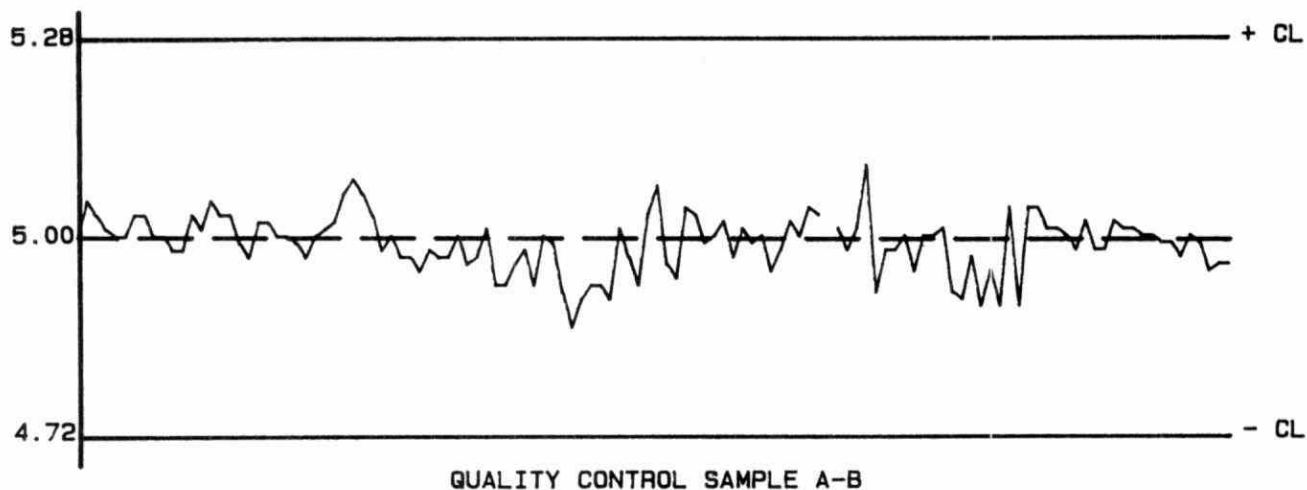
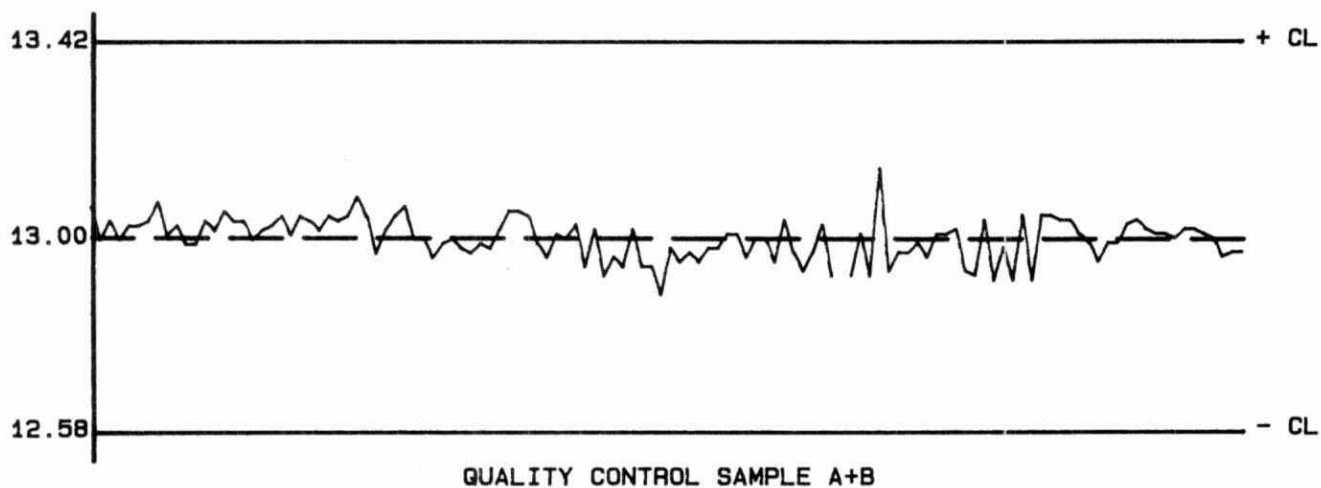
On any given day the calibration is accepted if the values obtained lie within the ranges:

12.58 to 13.42 for A+B

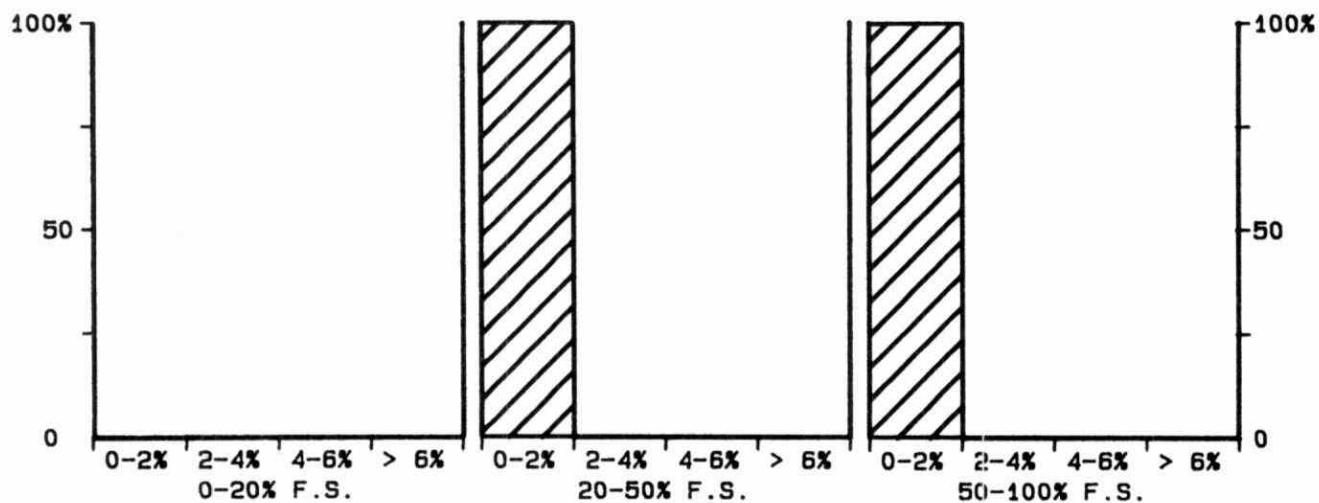
4.72 to 5.28 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
9	0.00 - 5.00	0.054	1.3
45	5.00 - 7.00	0.034	0.5
99	7.00 - 8.00	0.026	0.3
28	8.00 - 9.00	0.029	0.3
2	9.00 - 14.00	0.050	0.4
183	Overall	0.031	N/A

QUALITY CONTROL GRAPHS
PHFROM: 07/01/85
TO: 16/12/85

--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 14

*** PHENOLICS - REACTIVE ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/74
LIS Test Name Code: PHNOL Units : ug/L as Phenol
Work Station Code : ROPHEN Unit Code : 063704
Method Code : 002BC2 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents,
Domestic Water Supplies, Leachates, Sewages, Industrial Wastes

SAMPLING:

Quantity Required: 250 mL
Container : Glass
Preservative : Copper sulphate-phosphoric acid
Other : Special bottle (with white cap) containing preservative is available

ANALYTICAL PROCEDURE:

Samples are automatically distilled from an acid media, and reactive phenolics in the distillate are determined colourimetrically by formation of an antipyrene dye through reactions with 4-aminoantipyrene and potassium ferricyanide. Approximate absorbance: 0.03 at the 50 ug/L as phenol level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 505 nm.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.2 Detection Criterion (T): 1.0

CALIBRATION:

BL plus 1 standard

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA
Drift : BL plus 1 standard

NOTES:

A report identifying reactive phenolics is available on request.

PHENOLICS - REACTIVE
QUALITY CONTROL DATA FROM 04/01/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 1.0 to 50.0 ug/L as PHENOL

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	95	40.0	40.0	0.0	0.34
b :	95	10.0	10.3	0.3	0.31
a+b :	95	50.0	50.3	0.3	0.42
a-b :	95	30.0	29.8	-0.2	0.50

s.d.(AB): Sw(within run): 0.35 S(between runs): 0.33 S/Sw: 0.92

On any given day the calibration is accepted if the values obtained lie within the ranges:

47.8 to 52.2 for A+B
 28.5 to 31.5 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
188	0.0 - 5.0	0.35	39.9
13	5.0 - 10.0	0.45	5.7
15	10.0 - 25.0	1.14	6.9
11	25.0 - 50.0	0.95	2.8
227	Overall	0.49	N/A

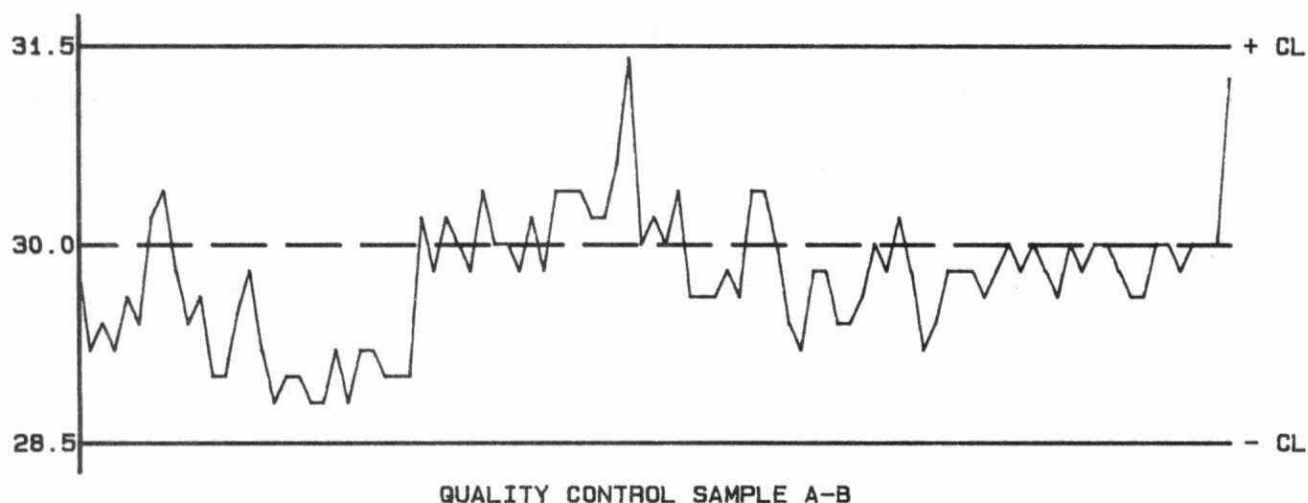
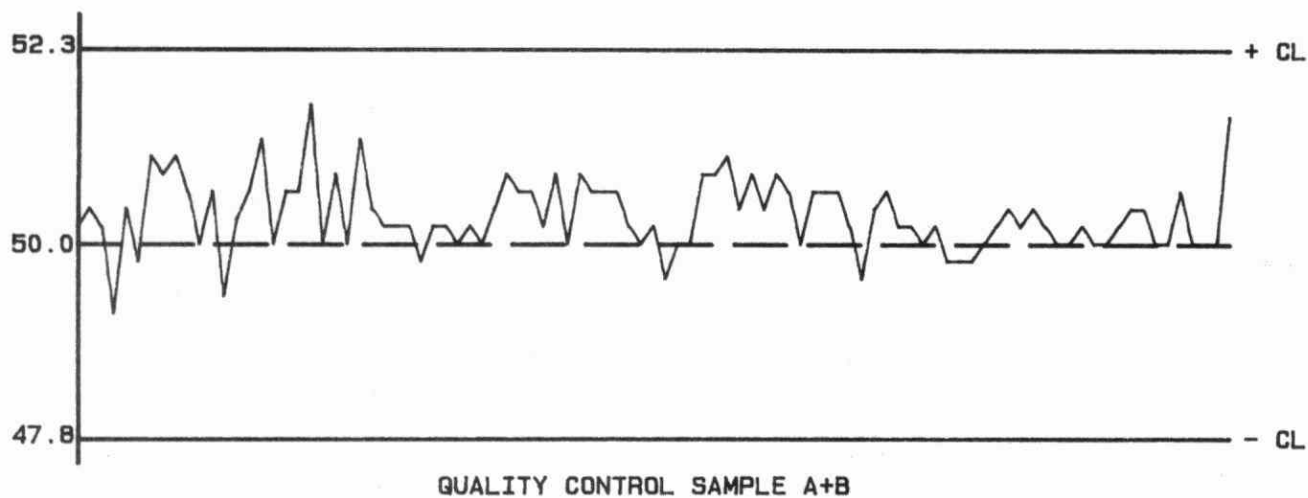
DETECTION CRITERION: 1.0

OTHER CHECKS:

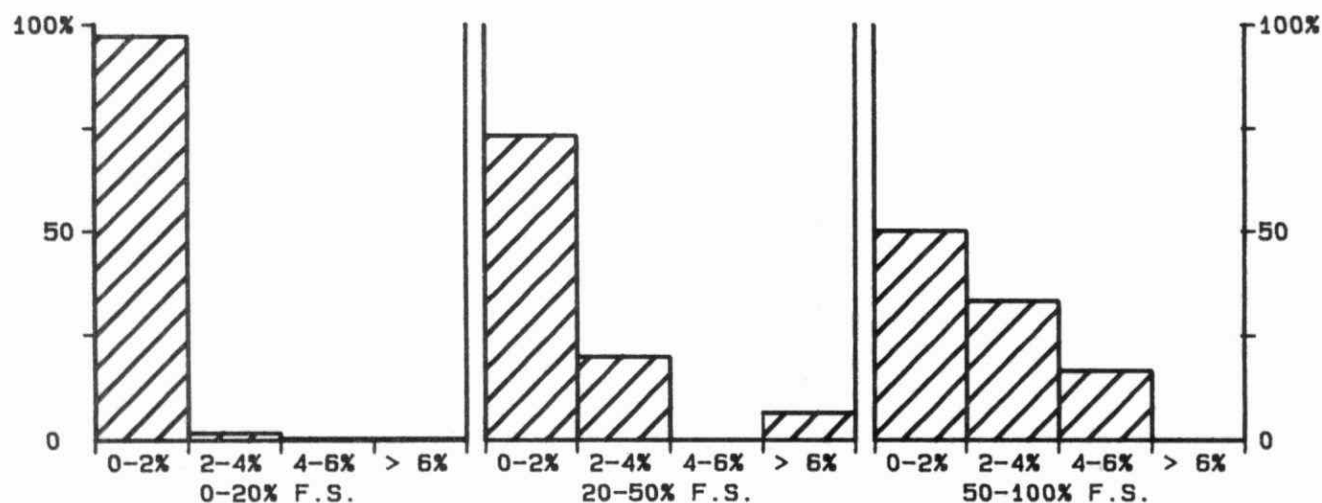
	Number of Data	Data Mean	Standard(1) Deviation
Std Cal :	92	918	9.2
Long Term Blank :	95	0.2	0.11

QUALITY CONTROL GRAPHS PHENOLICS - REACTIVE (UG/L AS PHENOL)

FROM: 04/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 UG/L AS PHENOL

*** PHOSPHORUS - REACTIVE ORTHOPHOSPHATE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/79
LIS Test Code Name:	PP04FR	Units	: mg/L as P
Work Station Code	: RNDNP	Unit Code	: 064815
Method Code	: 103DC2	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents.			

SAMPLING:

Quantity Required: 50 mL
 Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Orthophosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance : 0.2 at the 0.13 mg/L as P level.

N.B. Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.0005

Detection Criterion (T): 0.0030

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
 Drift : BL plus 1 standard

MODIFICATIONS:

01/02/84 - Sample filtration was eliminated for all sample classes but Great Lakes (G). Reduction period was reduced from 4 to 2 min. to lessen danger of poly phosphate conversion to orthophosphate during analysis.

15/05/84 - Microcomputer system was introduced. At this time the number of calibration standards was increased from 3 to 7, and the calibration technique was changed from linear interpolation to the use of a quadratic.

01/10/84 - Sample filtration was eliminated for Great Lakes (G) samples.

PHOSPHORUS - REACTIVE ORTHOPHOSPHATE
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Rivers and Lakes

Analytical Range: 0.0028 to 0.1250 mg/L as P

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	139	0.1000	0.1005	0.0005	0.00219
b :	139	0.0250	0.0259	0.0009	0.00157
a+b :	139	0.1250	0.1263	0.0013	0.00275
a-b :	139	0.0750	0.0746	-0.0004	0.00263
c :	139	0.0250	0.0259	0.0009	0.00156
d :	139	0.0125	0.0127	0.0002	0.00089
c+d :	139	0.0375	0.0385	0.0010	0.00234
c-d :	139	0.0125	0.0132	0.0007	0.00100

s.d.(AB): SW(within run): 0.00186 S(between runs): 0.00191 S/SW: 1.02
s.d.(CD): SW(within run): 0.00071 S(between runs): 0.00127 S/SW: 1.80

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.1194 to 0.1306 for A+B
0.0712 to 0.0787 for A-B
0.0337 to 0.0412 for C+D
0.0100 to 0.0150 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	234	0.0000 - 0.0100	0.0009	28.1
	39	0.0100 - 0.0200	0.0012	8.8
	51	0.0200 - 0.0500	0.0097	31.5
	51	0.0500 - 0.1250	0.0136	17.7
	375	Overall	0.0062	N/A

DETECTION CRITERION: 0.0028

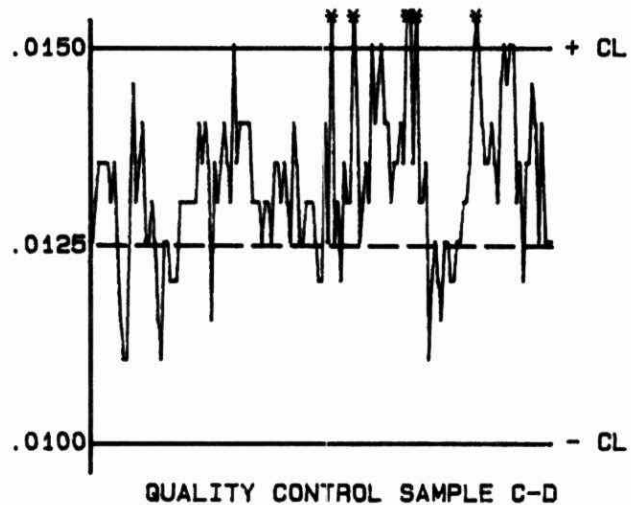
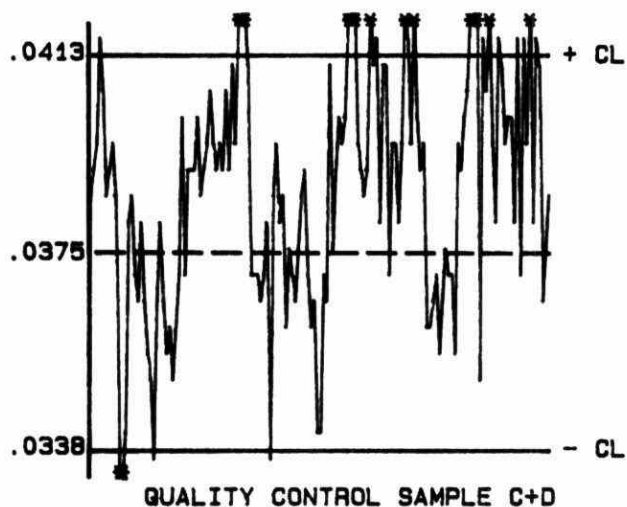
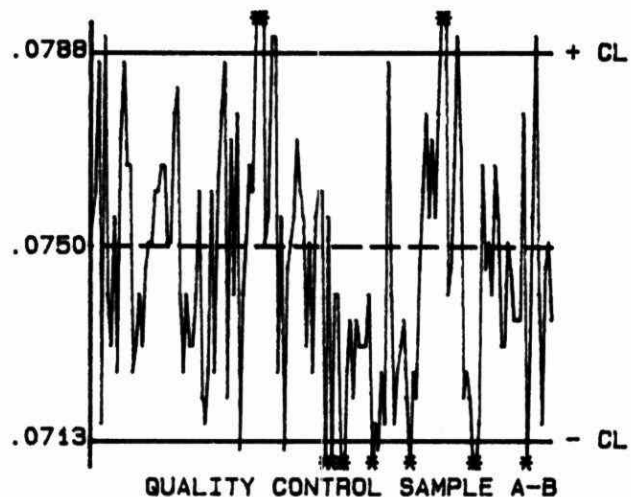
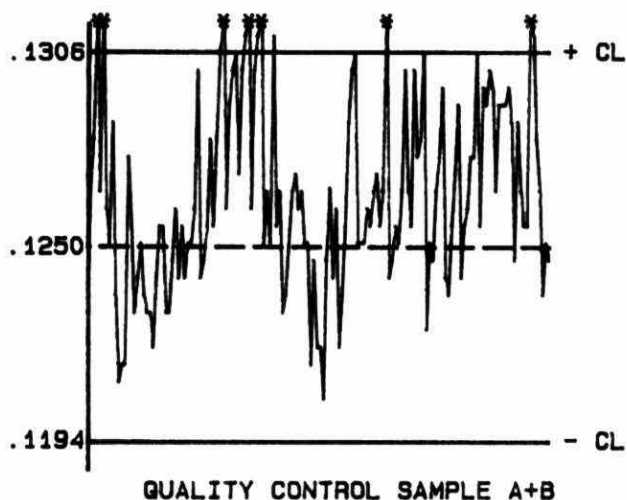
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	139	0.0010	0.00049

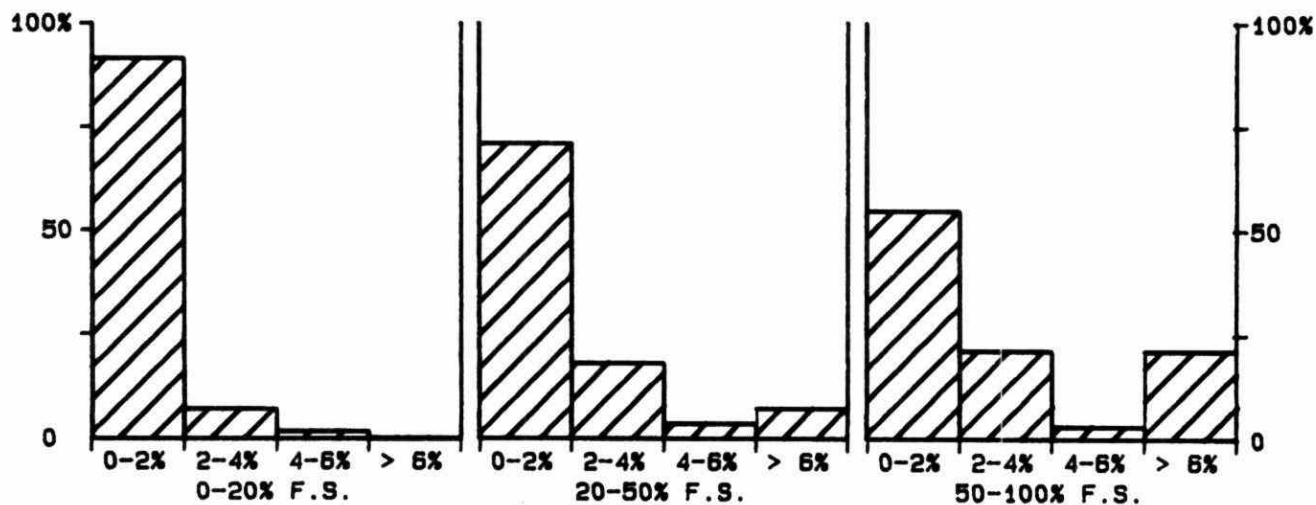
QUALITY CONTROL GRAPHS PHOSPHORUS - REACTIVE ORTHOPHOSPHATE (MG/L AS P)

FROM: 03/01/85

TO: 28/01/86



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): .125 MG/L AS P

*** PHOSPHORUS - REACTIVE ORTHOPHOSPHATE ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/79
LIS Test Name Code: PP04FR Units : mg/L as P
Work Station Code : SNH3P Unit Code : 064815
Method Code : 103BC2 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Leachate, Domestic Waters, Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent. Approximate absorbance : 0.4 at the 4.0 mg/L as P level.
N.B. Ammonia plus ammonium is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.
Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.05

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 4 standards, eg, QCA
Drift : BL plus 2 standards

PHOSPHORUS - REACTIVE ORTHOPHOSPHATE
QUALITY CONTROL DATA FROM 03/01/85 TO 30/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.05 to 10.00 mg/L as P

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard (1) Deviation
a	136	7.00	6.93	-0.07	0.104
b	136	3.50	3.45	-0.05	0.059
a+b	136	10.50	10.37	-0.13	0.141
a-b	136	3.50	3.48	-0.02	0.093
c	137	3.50	3.54	0.04	0.061
d	136	0.70	0.70	0.00	0.031
c+d	136	4.20	4.24	0.04	0.073
c-d	136	2.80	2.83	0.03	0.063

s.d.(AB): Sw(within run): 0.066 S(between runs): 0.035 S/Sw: 1.29
s.d.(CD): Sw(within run): 0.045 S(between runs): 0.048 S/Sw: 1.09

On any given day the calibration is accepted if the values obtained lie within the ranges:

10.05 to 10.95 for A+B
3.20 to 3.80 for A-B
3.96 to 4.44 for C+D
2.64 to 2.96 for C-D

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean (2) s.d.	Coefficient of var. (%)
	136	0.00 - 0.40	0.017	36.3
	20	0.40 - 1.00	0.042	6.0
	22	1.00 - 2.00	0.083	5.4
	24	2.00 - 4.00	0.068	2.4
	17	4.00 - 10.00	0.132	2.3
	219	Overall	0.054	N/A

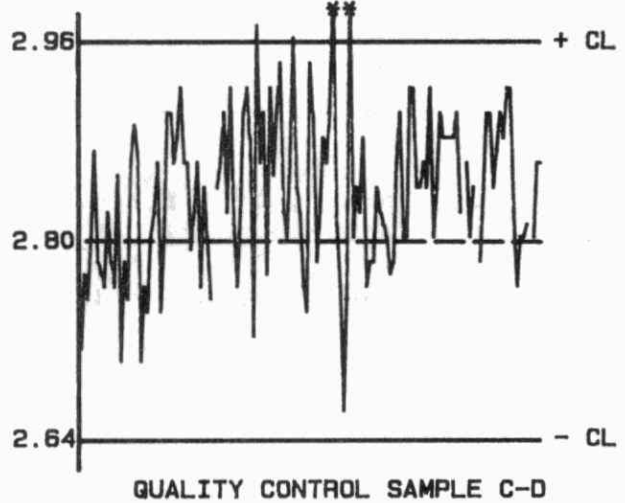
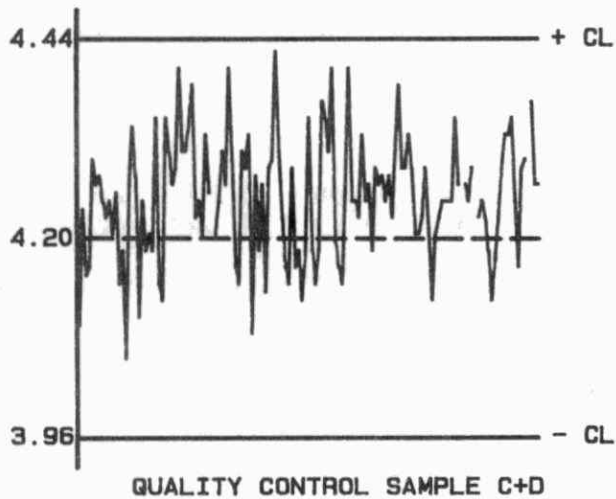
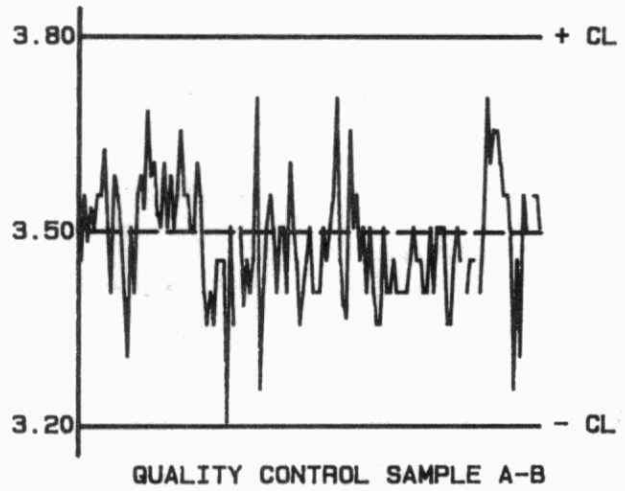
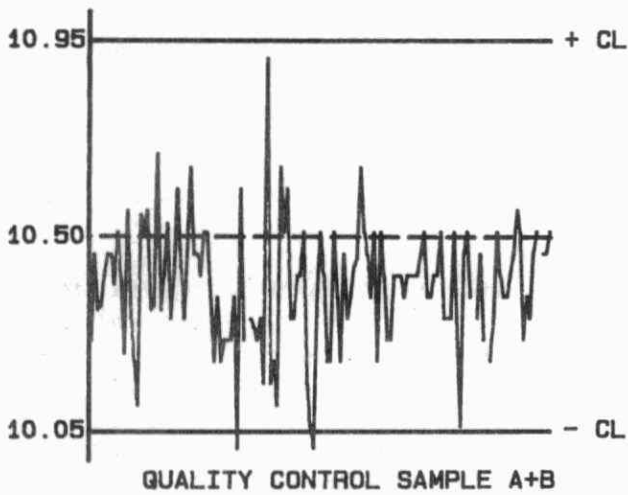
DETECTION CRITERION: 0.05**OTHER CHECKS:**

	Number of Data	Data Mean	Standard (1) Deviation
Std. Cal	82	665	44.4
Long Term Blank	113	0.01	0.000

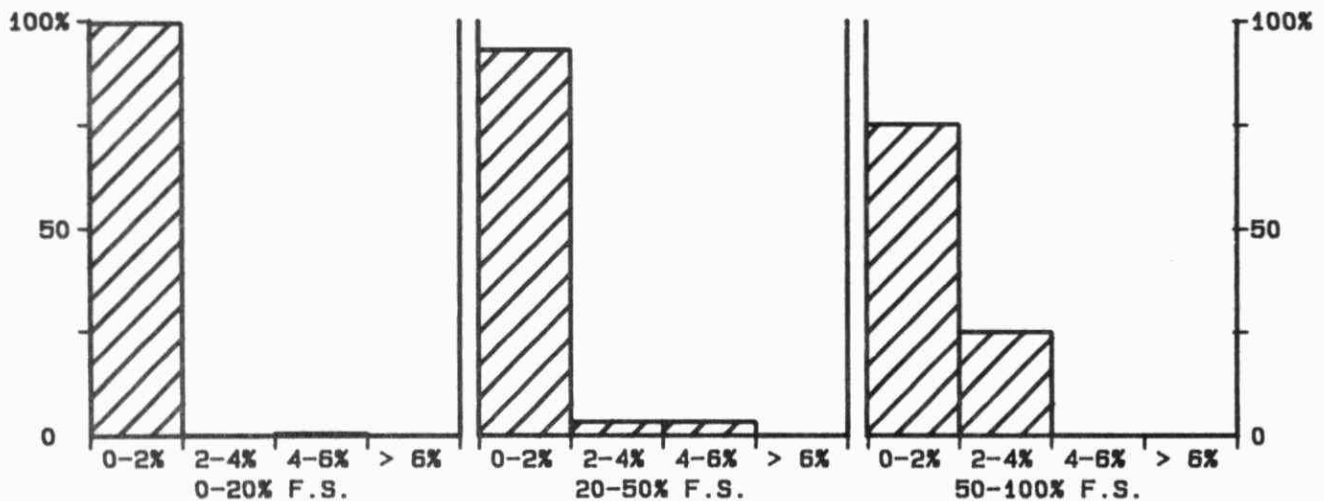
QUALITY CONTROL GRAPHS PHOSPHORUS - REACTIVE ORTHOPHOSPHATE (MG/L AS P)

FROM: 03/01/85

TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 10 MG/L AS P

*** PHOSPHORUS - TOTAL ***

Laboratory : Dorset Method Introduced: 22/03/79
Supervisor : F. Tomassini Units : ug/L as P
Sample Type/Matrix: Streams, Lakes, Precipitation

SAMPLING:

Quantity Required: 35 mL
Container : Specially marked Pyrex culture tubes with Teflon-lined caps

ANALYTICAL PROCEDURE:

After withdrawal of excess volume, digestion reagent is added and samples are autoclaved in sulphuric acid-potassium persulphate media at 121 C for 60 min. The orthophosphate content of the digestate is determined colourimetrically by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.
Approximate absorbance : 0.3 at the 200 ug/L as P level.

INSTRUMENTATION:

Autoclave plus basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.1 Detection Criterion (T): 0.8

CALIBRATION:

BL plus 2 undigested standards

CONTROLS:

Calibration : LTBL plus 4 undigested standards, eg, QCA
Recovery : 3 digested BL plus 4 digested standards, eg, R1
Drift : BL every 10 samples and BL plus 2 undigested standards every 20 samples.

NOTES:

System is calibrated with undigested standards, but sample concentrations are adjusted to reflect day's value for digested blank.

PHOSPHORUS - TOTAL
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Dorset

Analytical Range: 0.8 to 200 ug/L as P

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	164	171	171	0	1.6
b :	164	57	57	0	0.6
a+b :	164	228	229	1	2.0
a-b :	164	114	114	0	1.2
c :	164	17.1	17.1	0.0	0.20
d :	164	5.7	5.7	0.0	0.09
c+d :	164	22.8	22.9	0.1	0.26
c-d :	164	11.4	11.4	0.0	0.17

s.d.(AB): Sw(within run): 0.8 S(between runs): 1.2 S/Sw: 1.42
s.d.(CD): Sw(within run): 0.12 S(between runs): 0.16 S/Sw: 1.29

On any given day the calibration is accepted if the values obtained lie within the ranges:

219 to 237 for A+B
108 to 120 for A-B
19.8 to 25.8 for C+D
9.4 to 13.4 for C-D

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	162	140	140	2.0
r2 :	163	70	70	1.3
r3 :	164	14.0	14.2	0.46
r4 :	162	7.0	7.2	0.47

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
83	0.0 - 5.0	0.28	8.1
156	5.0 - 10.0	0.65	8.9
128	10.0 - 20.0	0.66	4.5
76	20 - 50	2.4	7.7
20	50 - 200	2.1	2.5
463	Overall	1.2	N/A

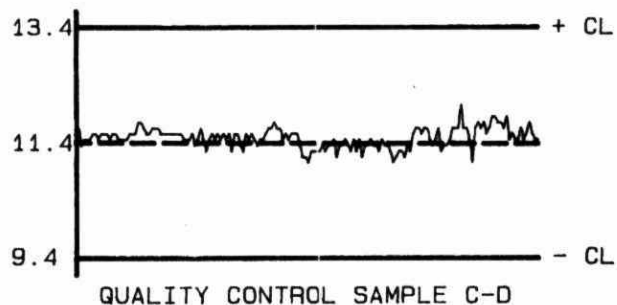
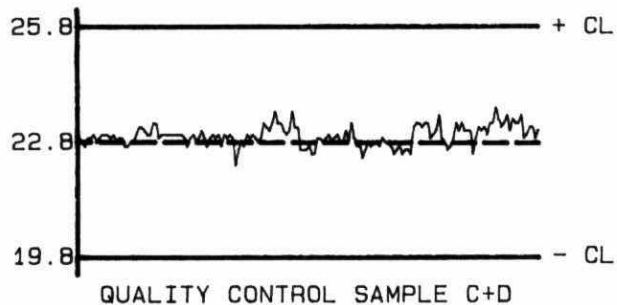
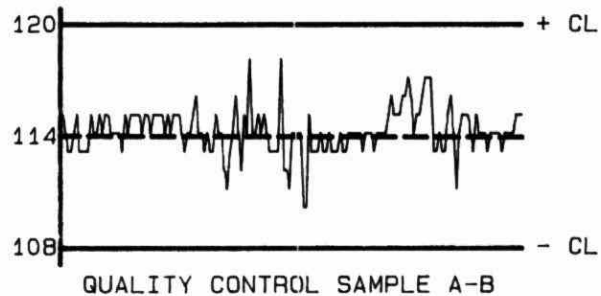
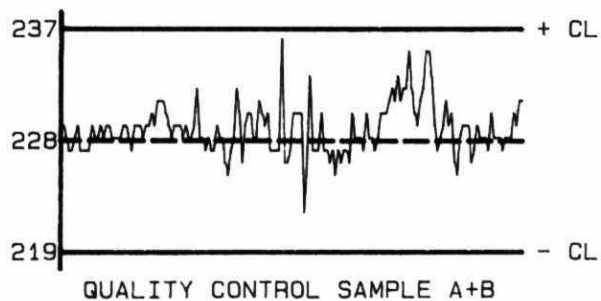
DETECTION CRITERION: 0.8**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal. :	153	524	19.7
Long Term Blank :	164	0.0	0.14
Digested Blank :	164	0.9	0.24

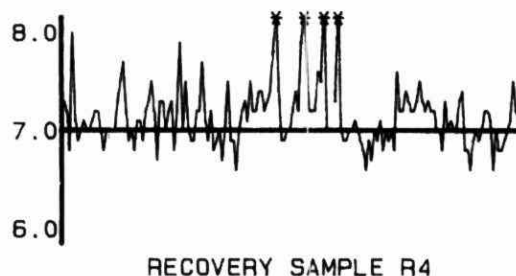
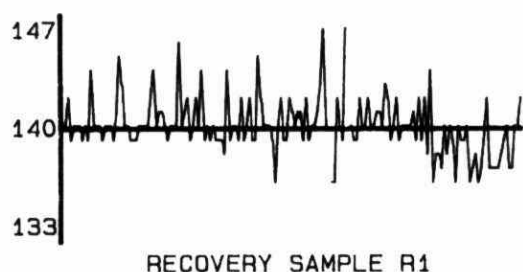
QUALITY CONTROL GRAPHS PHOSPHORUS - TOTAL (UG/L AS P)

FROM: 03/01/85

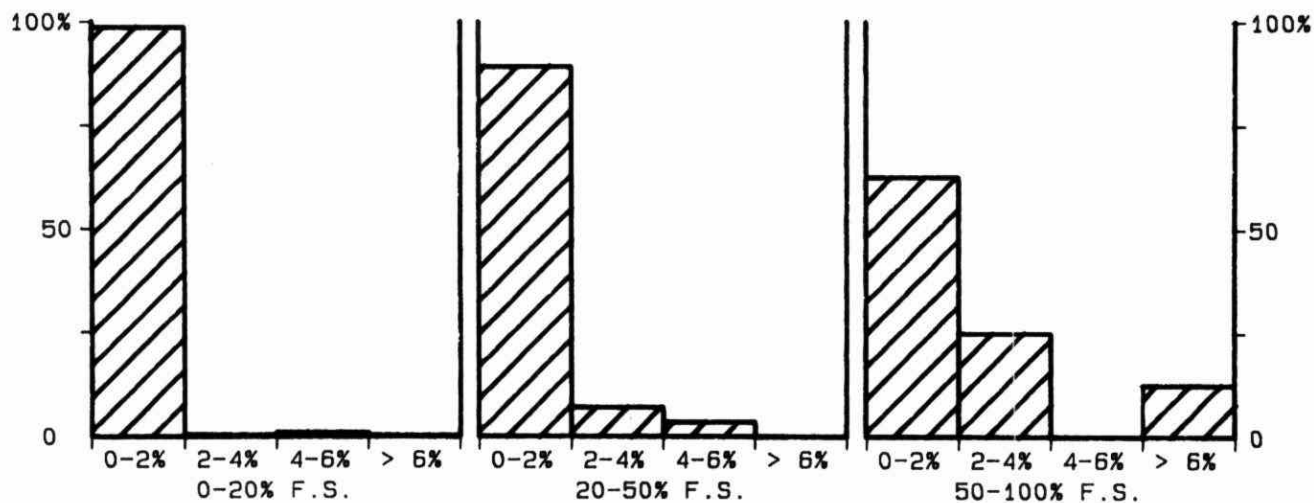
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 200 UG/L AS P

*** PHOSPHORUS-TOTAL ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/79
LIS Test Name Code: PPUT Units : mg/L as P
Work Station Code : RTNP Unit Code : 064815
Method Code : 504AC2 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents.

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic (polystyrene)

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters kept at 200 C and 360 C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance : 0.4 at the 0.20 mg/L as P level.

N.B. Total Kjeldahl nitrogen is determined simultaneously.

INSTRUMENTATION:

- Block digesters(2)
- Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.
- Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.001

Detection Criterion (T): 0.007

CALIBRATION:

BL plus 3 undigested standards

CONTROLS:

Calibration : LTBL plus 2 undigested standards, eg, QCA
Recovery : 3 digested BL plus 3 digested standards in duplicate, eg, R1
Drift : BL plus 1 undigested standard

MODIFICATIONS:

15/08/83 - Microcomputer system was introduced. At this time the calibration technique was changed from linear interpolation to the use of a quadratic.

NOTES:

System is calibrated with undigested standards, but sample concentrations are adjusted to reflect day's value for digested blank.

PHOSPHORUS-TOTAL
QUALITY CONTROL DATA FROM 01/01/85 TO 23/12/85

Lab: Rivers and Lakes

Analytical Range: 0.007 to 0.200 mg/L as P

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	158	0.150	0.149	-0.001	0.0017
b :	158	0.050	0.050	0.000	0.0020
a+b :	158	0.200	0.199	-0.001	0.0030
a-b :	158	0.100	0.099	-0.001	0.0021

s.d.(AB): Sm(within run): 0.0015 S(between runs): 0.0019 S/Sm: 1.25

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.191 to 0.208 for A+B
 0.094 to 0.106 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	158	0.140	0.137	0.0047
r2 :	158	0.084	0.082	0.0028
r3 :	158	0.028	0.028	0.0023

DUPLICATES:

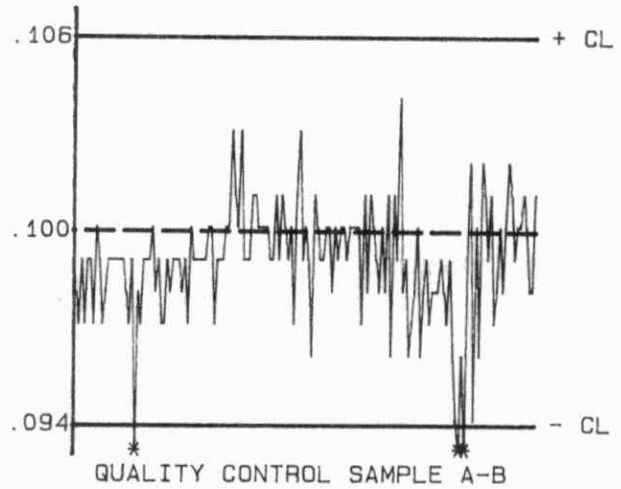
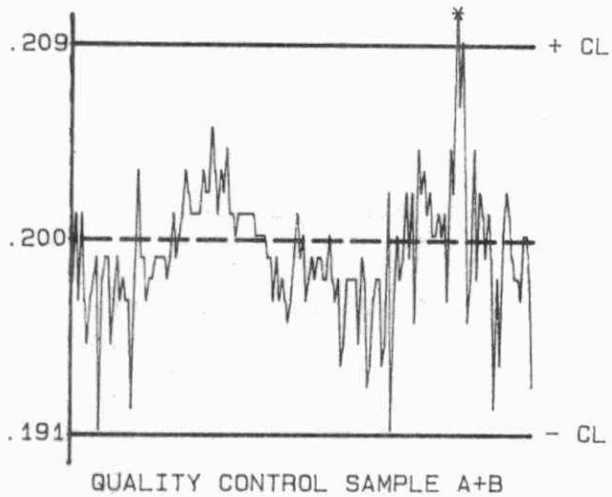
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
196	0.000 - 0.020	0.0023	24.5
101	0.020 - 0.050	0.0038	11.7
38	0.050 - 0.100	0.0068	10.1
25	0.100 - 0.200	0.0101	7.5
360	Overall	0.0044	N/A

DETECTION CRITERION: 0.007**OTHER CHECKS:**

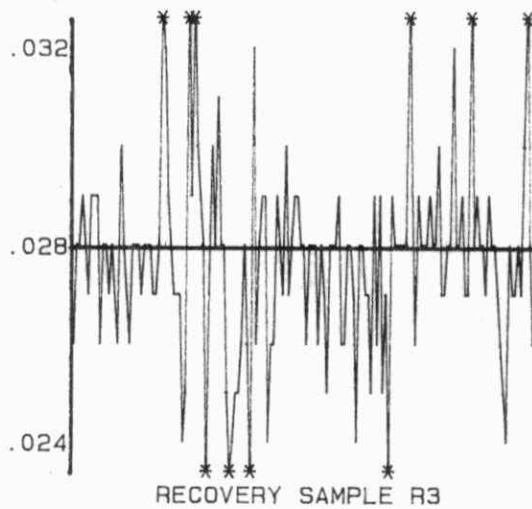
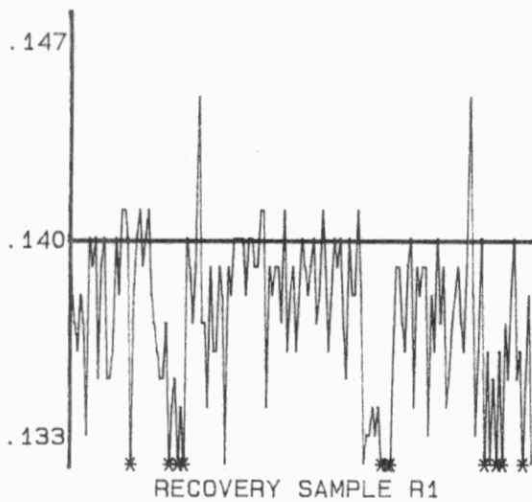
	Number of Data	Data Mean	Standard(1) Deviation
Long Term Blank :	153	0.001	0.0003
Digested Blank :	156	0.002	0.0021

QUALITY CONTROL GRAPHS PHOSPHORUS-TOTAL (MG/L AS P)

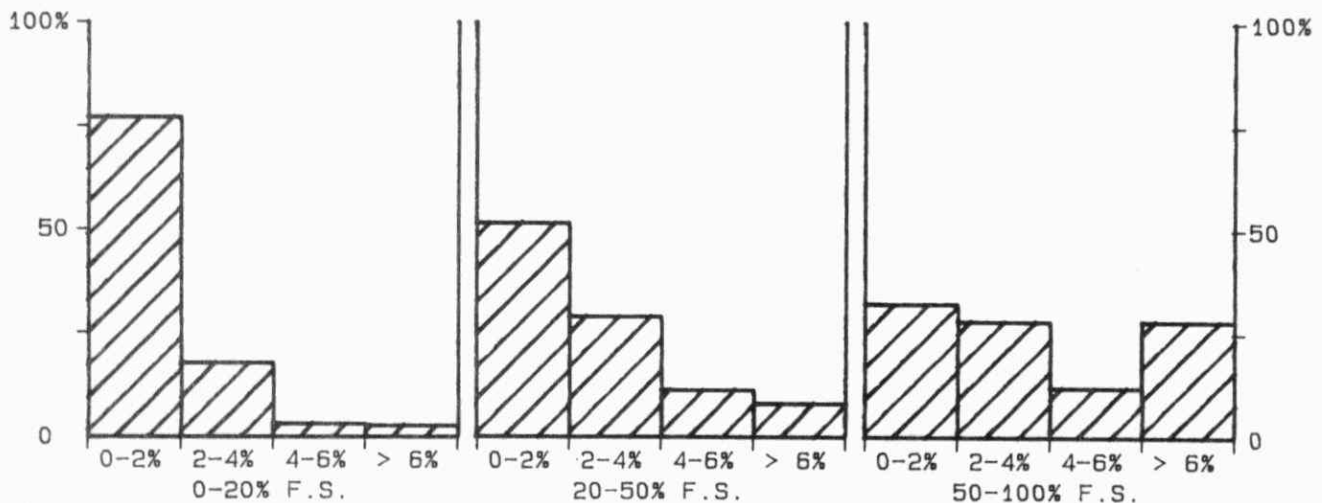
FROM: 01/01/85
TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): .2 MG/L AS P

*** PHOSPHORUS - TOTAL ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: 01/04/79
LIS Test Name Code: PPUT Units : mg/L as P
Work Station Code : STKNP Unit Code : 064815
Method Code : 504BC2 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Domestic Waters, Effluents,
Leachates

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters kept at 200 C and 360 C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance : 0.4 at the 2.0 mg/L as P level.

N.B. Total Kjeldahl nitrogen is determined simultaneously.

INSTRUMENTATION:

- Block digesters(2)
- Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01

Detection Criterion (T): 0.03**

CALIBRATION:

BL plus 2 undigested standards

CONTROLS:

Calibration : LTBL plus 4 undigested standards, eg, QCA
Recovery : 2 digested BL plus 3 digested standards in duplicate, eg, R1
Drift : BL plus 2 undigested standards

MODIFICATIONS:

01/10/85 -High range added, full scale changed from 2 to 5 mg/L as P. New calibration controls added. Calibration control results collected before high range was implemented are included in plot.

NOTES:

System is calibrated with undigested standards.
**Minimum dilution is 50% (i.e. factor of two). Therefore, minimum increment and detection criterion are actually 0.02 and 0.06 respectively.

PHOSPHORUS - TOTAL
QUALITY CONTROL DATA FROM 03/01/85 TO 31/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 0.03 to 5.00 mg/L as P

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	115	3.50	3.47	-0.03	0.060
b :	114	1.40	1.36	-0.04	0.039
a+b :	114	4.90	4.83	-0.07	0.089
a-b :	114	2.10	2.10	0.00	0.048
c :	164	1.400	1.418	0.018	0.0249
d :	163	0.200	0.286	0.086	0.0188
c+d :	163	1.600	1.704	0.104	0.0393
c-d :	163	1.120	1.132	0.012	0.0221

s.d.(AB): Sw(within run): 0.034 S(between runs): 0.051 S/Sw: 1.49
s.d.(CD): Sw(within run): 0.0156 S(between runs): 0.0225 S/Sw: 1.44

On any given day the calibration is accepted if the values obtained lie within the ranges:

4.60 to 5.20 for A+B
1.90 to 2.30 for A-B
1.560 to 1.800 for C+D
1.040 to 1.200 for C-D

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	106	3.50	3.40	0.103
r2 :	147	1.40	1.39	0.036
r3 :	147	0.70	0.67	0.035

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
190	0.000 - 0.20	0.009	19.7
54	0.200 - 0.40	0.039	14.4
63	0.40 - 1.00	0.025	3.8
30	1.00 - 2.00	0.064	4.6
7	2.00 - 5.00	0.077	3.2
344	Overall	0.029	N/A

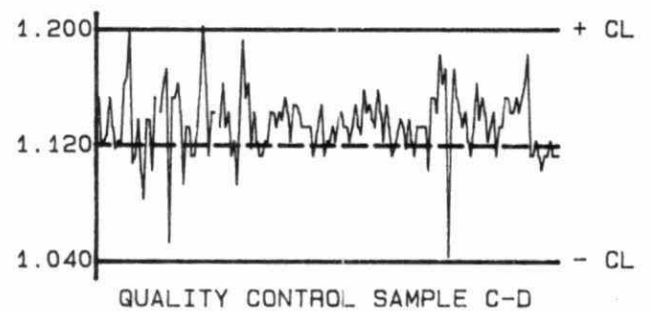
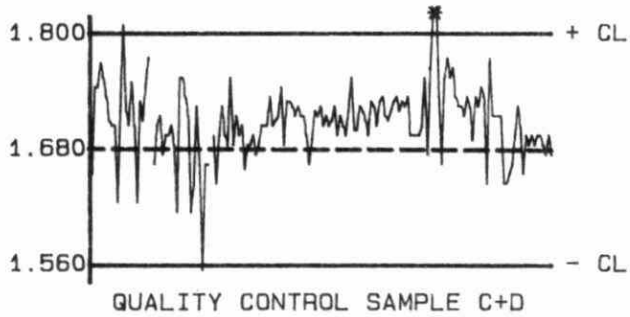
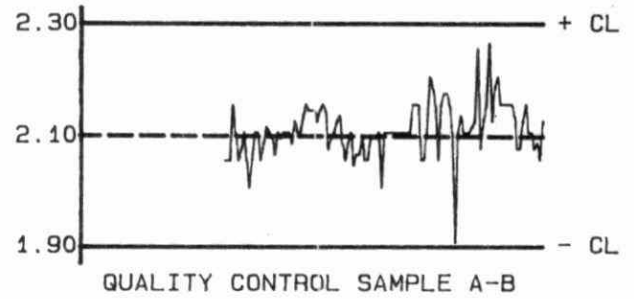
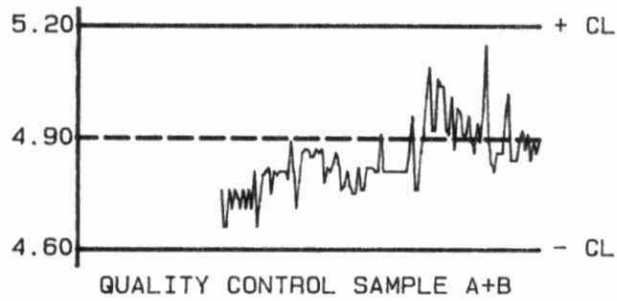
DETECTION CRITERION: 0.03**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal :	141	456	28.7
Long Term Blank :	147	0.007	0.0057
Digested Blank :	129	0.007	0.0035

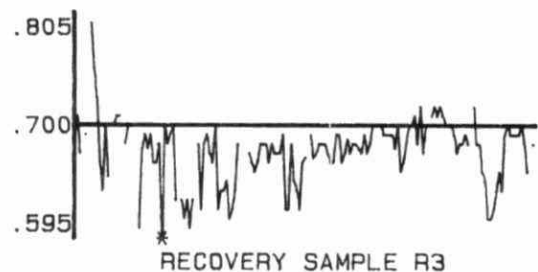
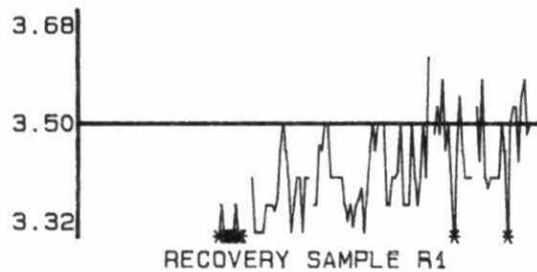
QUALITY CONTROL GRAPHS PHOSPHORUS - TOTAL (MG/L AS P)

FROM: 03/01/85

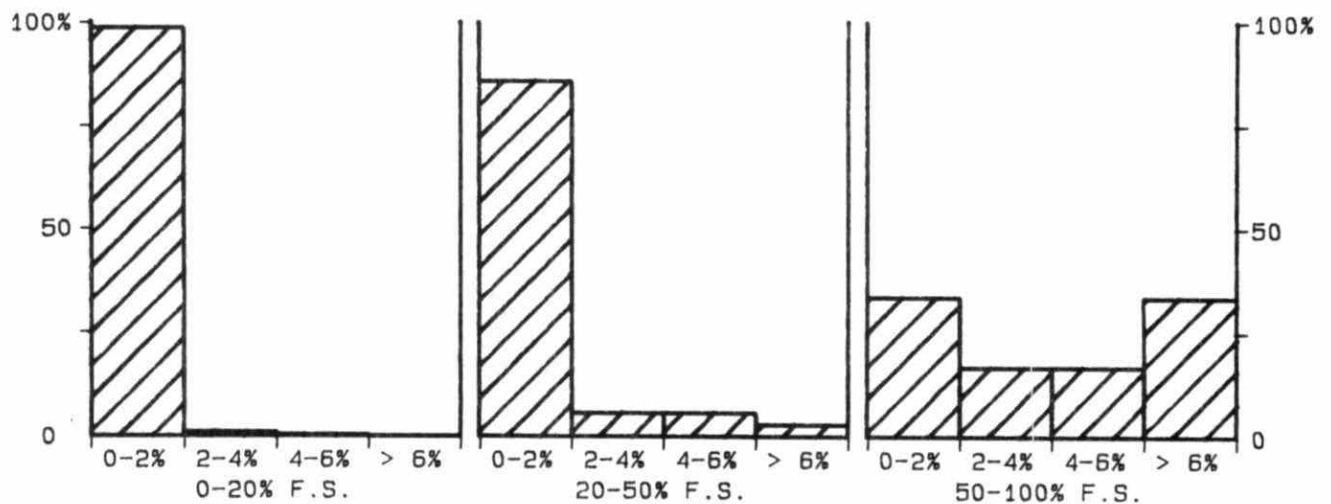
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 5 MG/L AS P

*** POTASSIUM ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	Before '74
LIS Test Name Code:	KKUR	Units	: mg/L as K
Work Station Code	: WNAK	Unit Code	: 064819
Method Code	: 002BA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.
Approximate absorbance: 0.15 at 10 mg/L as K level.

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS). Two analytical ranges are obtained from the output of the AAS.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.05	Detection Criterion (T):0.15

CALIBRATION:

BL plus 2 standards.

CONTROLS:

Calibration	: LTBL plus 3 standards, eg, QCA
Drift	: BL plus 3 standards

POTASSIUM
QUALITY CONTROL DATA FROM 02/01/85 TO 31/12/85

Lab: Domestic Water

Analytical Range: 0.15 to 40.0 mg/L as K

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	100	26.0	26.2	0.2	0.31
b :	100	6.5	6.5	0.0	0.14
a+b :	100	32.5	32.6	0.1	0.33
a-b :	100	19.5	19.7	0.2	0.36
c :	100	6.50	6.45	-0.05	0.107
d :	100	1.30	1.33	0.03	0.058
c+d :	100	7.80	7.79	-0.01	0.141
c-d :	100	5.20	5.12	-0.08	0.099

s.d.(AB): Sw(within run): 0.25 S(between runs): 0.24 S/Sw: 0.94
s.d.(CD): Sw(within run): 0.070 S(between runs): 0.086 S/Sw: 1.23

On any given day the calibration is accepted if the values obtained lie within the ranges:

30.7 to 34.3 for A+B
18.3 to 20.7 for A-B
7.20 to 8.40 for C+D
4.80 to 5.60 for C-D

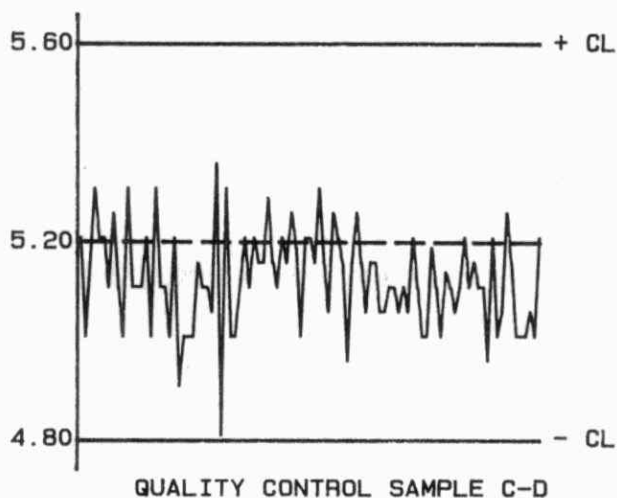
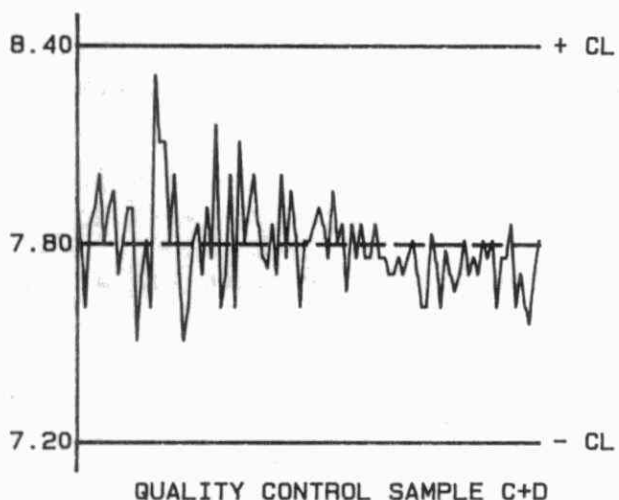
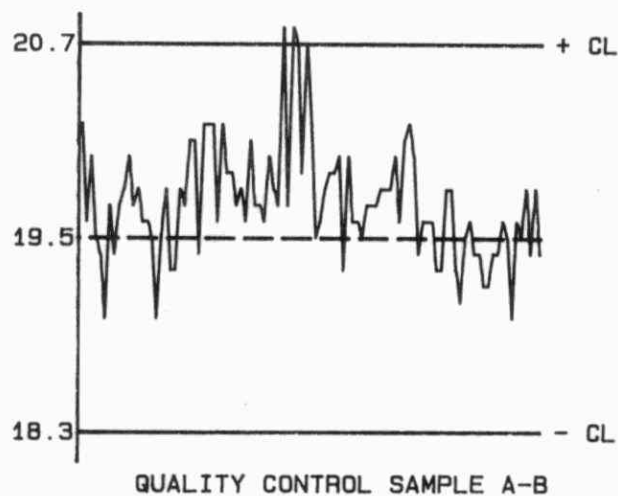
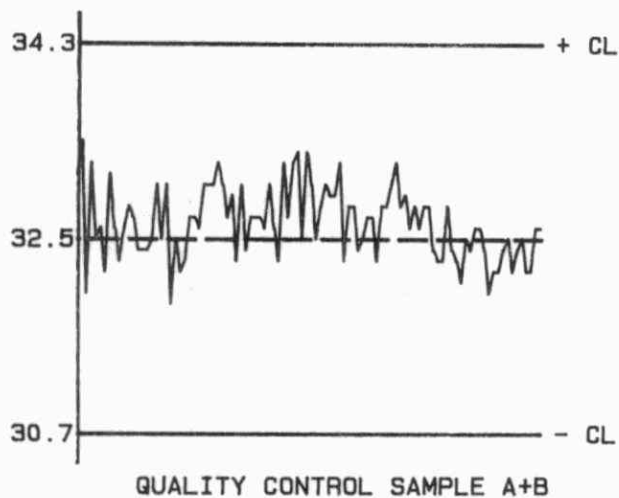
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	61	0.00 - 1.00	0.051	7.4
	116	1.00 - 2.00	0.065	4.4
	51	2.00 - 5.00	0.094	2.9
	16	5.0 - 10.0	0.11	1.6
	10	10.0 - 40.0	0.22	1.4
	254	Overall	0.08	N/A

DETECTION CRITERION: 0.15

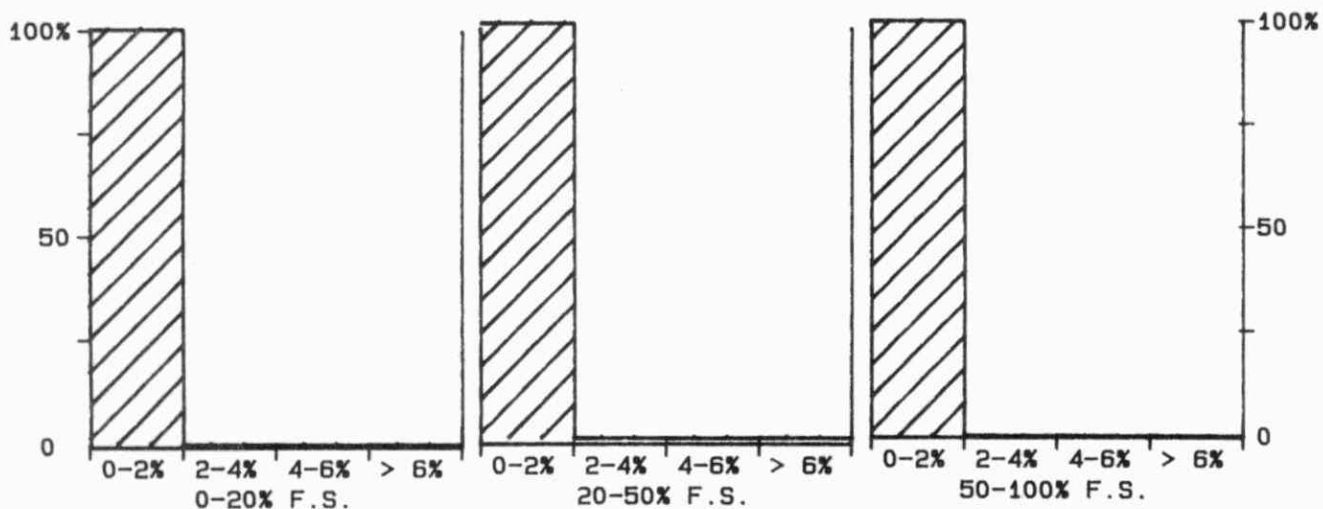
QUALITY CONTROL GRAPHS POTASSIUM (MG/L AS K)

FROM: 02/01/85

TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 40 MG/L AS K

*** POTASSIUM ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced	: 18/05/79
LIS Test Name Code	: KKUR	Units	: mg/L as K
Work Station Code	: PRAA	Unit Code	: 064819
Method Code	: 002EA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow.			

SAMPLING:

Quantity Required: 5 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Samples are analysed by AAS at 766.5 nm with an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.
Approximate absorbance: 0.5 at the 1.00 mg/L level.

INSTRUMENTATION:

Automated modular flow injection atomic absorption spectrophotometer(AAS) system

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.005	Detection Criterion (T): 0.025

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL every 10 samples, 2 standards every 20 samples.

POTASSIUM
QUALITY CONTROL DATA FROM 08/01/85 TO 20/12/85

Lab: Precipitation

Analytical Range: 0.025 to 1.00 mg/L as K

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	71	0.600	0.595	-0.005	0.0106
b :	72	0.100	0.096	-0.004	0.0101
a+b :	69	0.700	0.691	-0.009	0.0139
a-b :	69	0.500	0.499	-0.001	0.0148

s.d.(AB): Sw(within run): 0.0105 S(between runs): 0.0104 S/Sw: 0.99

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.625 to 0.775 for A+B
 0.450 to 0.550 for A-B

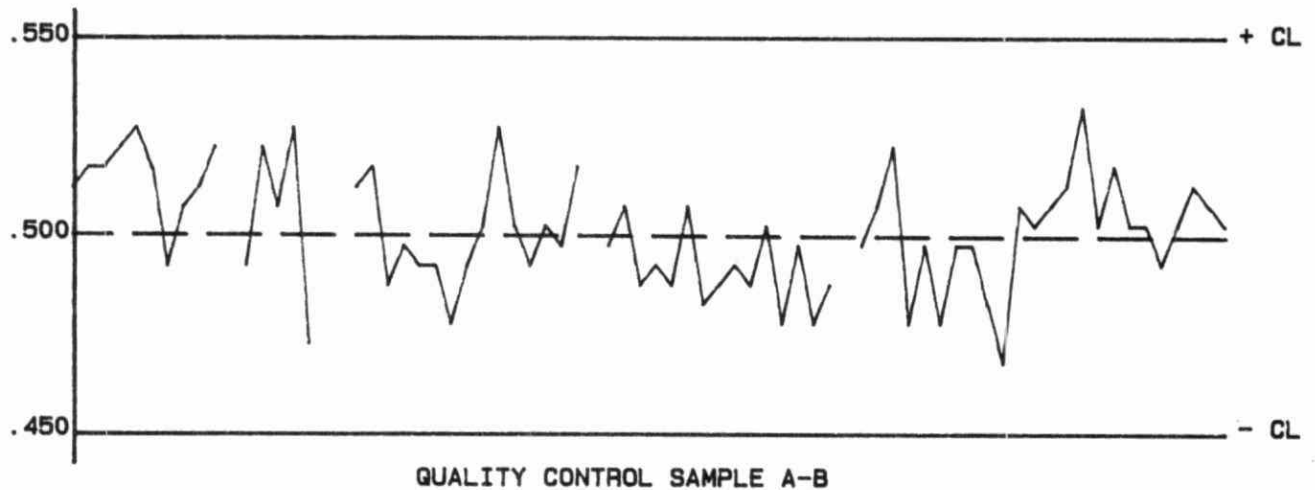
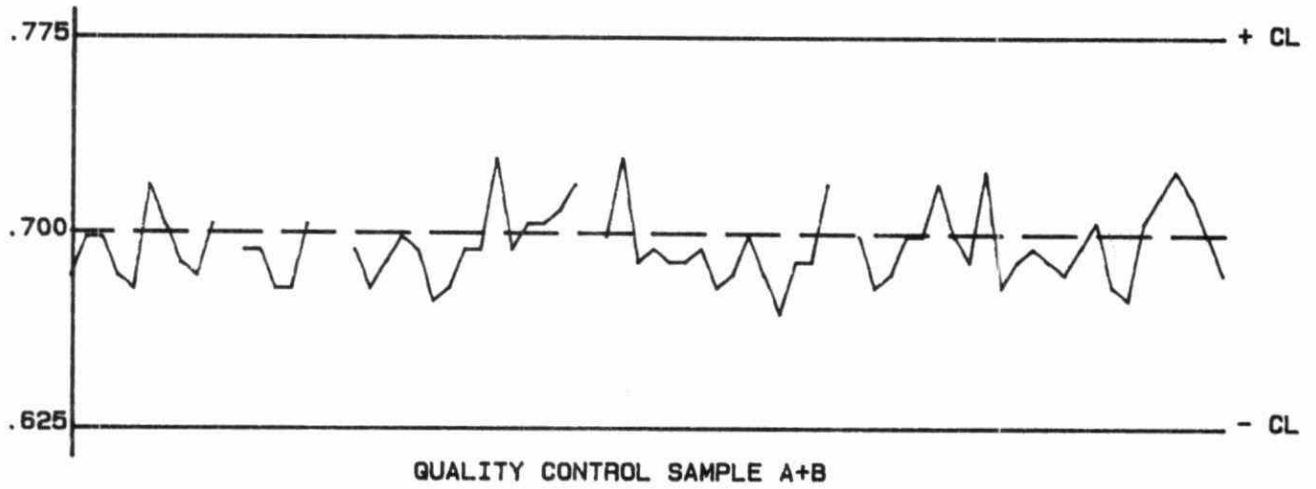
DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
114	0.000 - 0.100	0.0082	22.2
16	0.100 - 0.200	0.0110	8.0
32	0.20 - 1.00	0.012	2.1
162	Overall	0.009	N/A

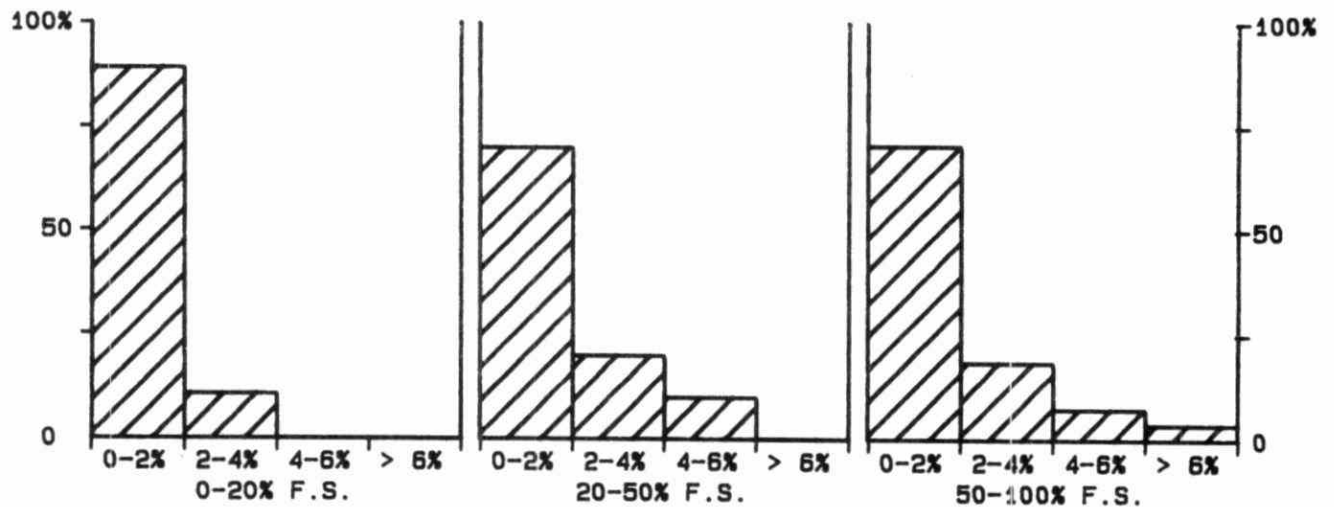
DETECTION CRITERION: 0.025

QUALITY CONTROL GRAPHS POTASSIUM (MG/L AS K)

FROM: 08/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1 MG/L AS K

*** POTASSIUM ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	KKUR	Units	: mg/L as K
Work Station Code	: RMAAS	Unit Code	: 064819
Method Code	: 002CA1,002DA1	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts, Effluents.		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.
Approximate absorbance: RMAAS: 0.8 full scale value

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS).

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T):0.12,0.12,0.05

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA for each analytical range
Drift : BL plus 1 standard for each analytical range

MODIFICATIONS:

01/12/81- Calibration range became 5.00 mg/L full scale; second analytical range was dropped.
01/03/84- Analytical range(RMNAKL) was added; full scale:1.00 mg/L. This range is currently restricted to special programs.
01/09/84- Analytical range(RMNAKH) was increased from 5.00 to 10.0 mg/L full scale. Calibration technique was changed from quadratric to linear interpolation. Sodium is no longer determined simultaneously.
25/09/85- Calibration range stayed at 10.0 mg/L but second analytical range was dropped. Concentration of QC solutions was modified. Microcomputer controlled system.

NOTES:

Three analytical ranges were used during 1985: 1.00, 10.0, and 10.0 mg/L full scale (difference in latter two ranges was choice of control solution concentrations) with the respective detection criteria shown above.

POTASSIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 09/09/85

Lab: Rivers and Lakes

Analytical Range: 0.12 to 10.00 mg/L as K

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	35	7.50	7.54	0.04	0.170
b :	35	2.50	2.52	0.02	0.062
a+b :	35	10.00	10.06	0.06	0.196
a-b :	35	5.00	5.01	0.01	0.164

s.d.(AB): Sw(within run): 0.116 S(between runs): 0.128 S/Sw: 1.10

On any given day the calibration is accepted if the values obtained lie within the ranges:

9.55 to 10.45 for A+B
 4.70 to 5.30 for A-B

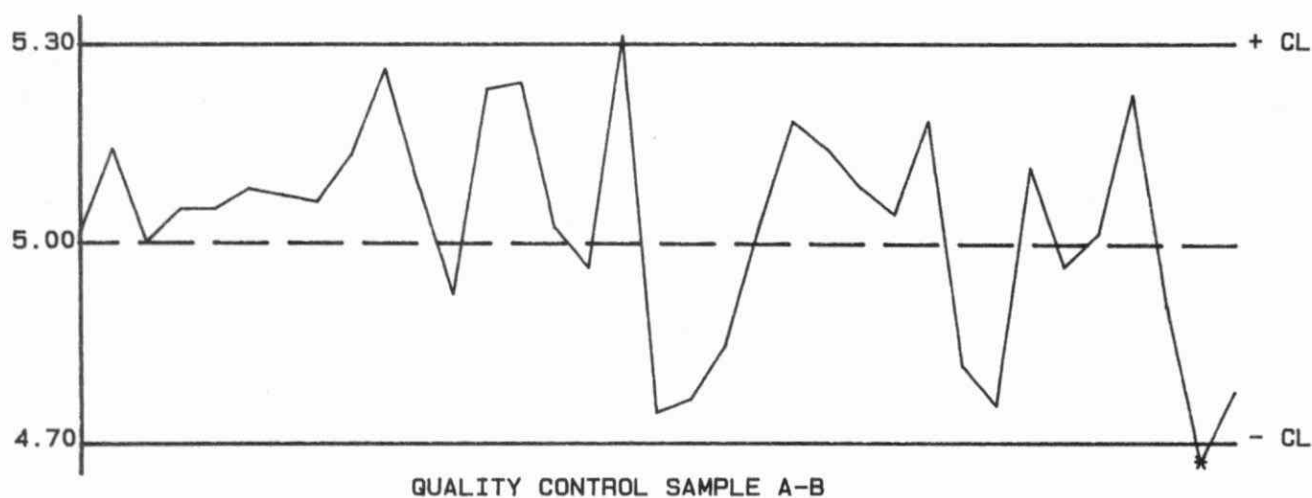
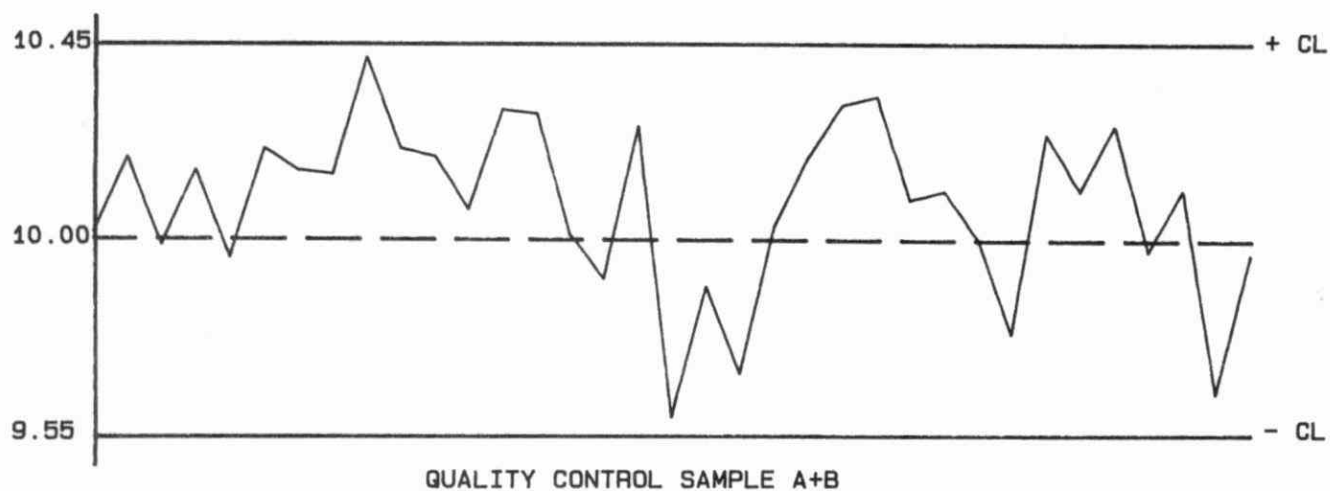
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	41	0.00 - 0.50	0.039	19.7
	16	0.50 - 1.00	0.030	4.2
	21	1.00 - 2.50	0.044	3.0
	15	2.50 - 5.00	0.063	1.8
	2	5.00 - 10.00	0.081	1.5
	95	Overall	0.045	N/A

DETECTION CRITERION: 0.12**OTHER CHECKS:**

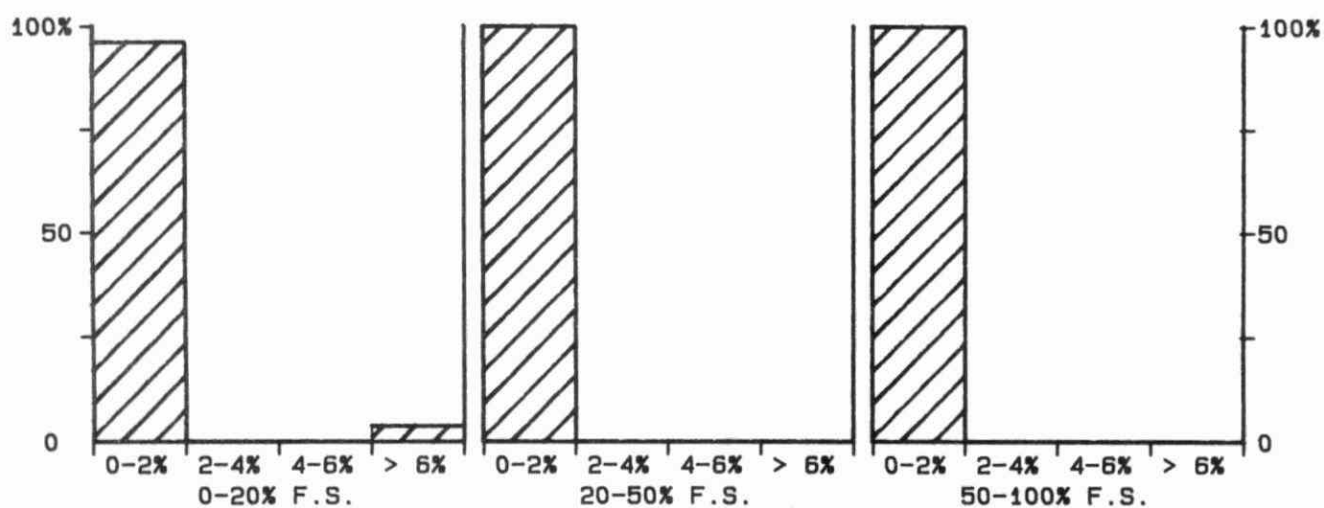
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	28	0.94	0.141
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS POTASSIUM (MG/L AS K)

FROM: 03/01/85
TO: 09/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



POTASSIUM
QUALITY CONTROL DATA FROM 25/09/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.05 to 10.00 mg/L as K

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	29	8.00	8.06	0.06	0.152
b :	29	0.70	0.70	0.00	0.019
a+b :	29	8.70	8.77	0.07	0.155
a-b :	29	7.30	7.36	0.06	0.152

s.d.(AB): Sw(within run): 0.107 S(between runs): 0.108 S/Sw: 1.01

On any given day the calibration is accepted if the values obtained lie within the ranges:

8.25 to 9.15 for A+B
 7.00 to 7.60 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
46	0.00 - 0.50	0.017	5.7
23	0.50 - 1.00	0.037	5.4
8	1.00 - 2.00	0.014	0.9
10	2.00 - 5.00	0.077	2.2
1	5.00 - 10.00	N/A	N/A
88	Overall	0.038	N/A

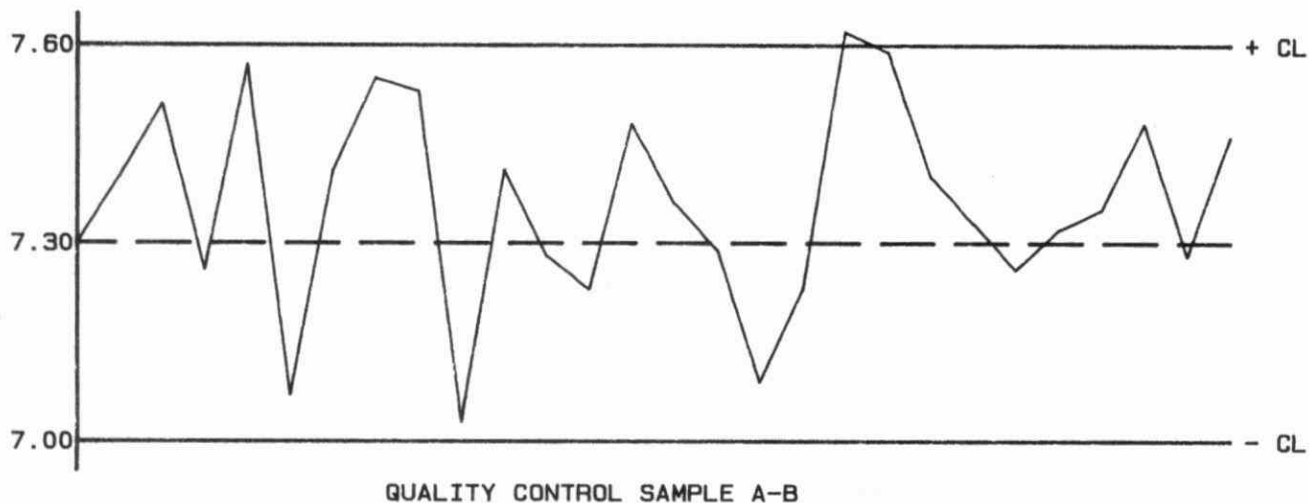
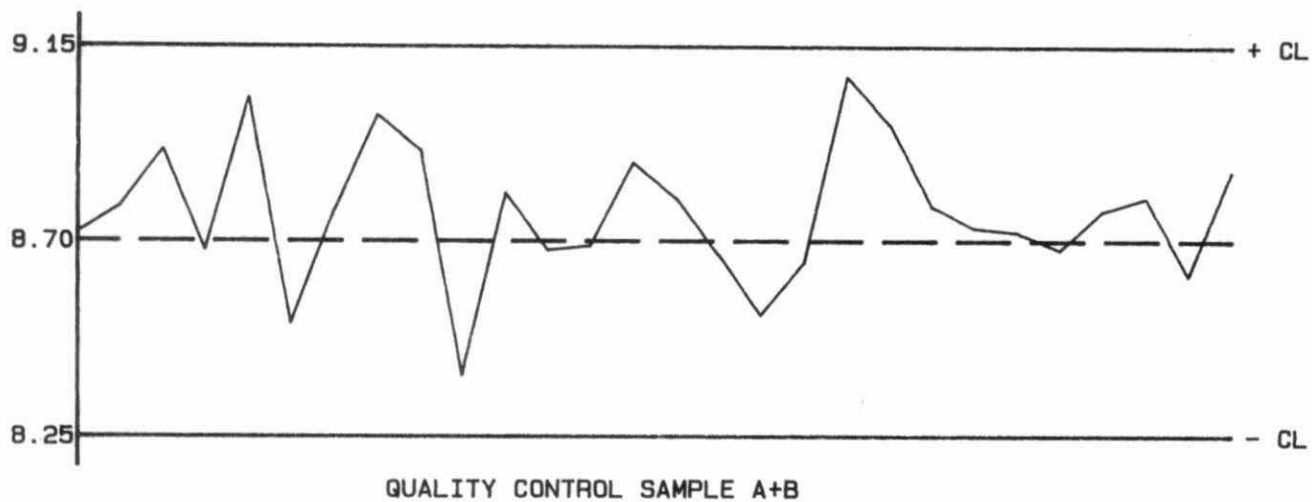
DETECTION CRITERION: 0.05**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	0	N/A	N/A
Long Term Blank :	0	N/A	N/A

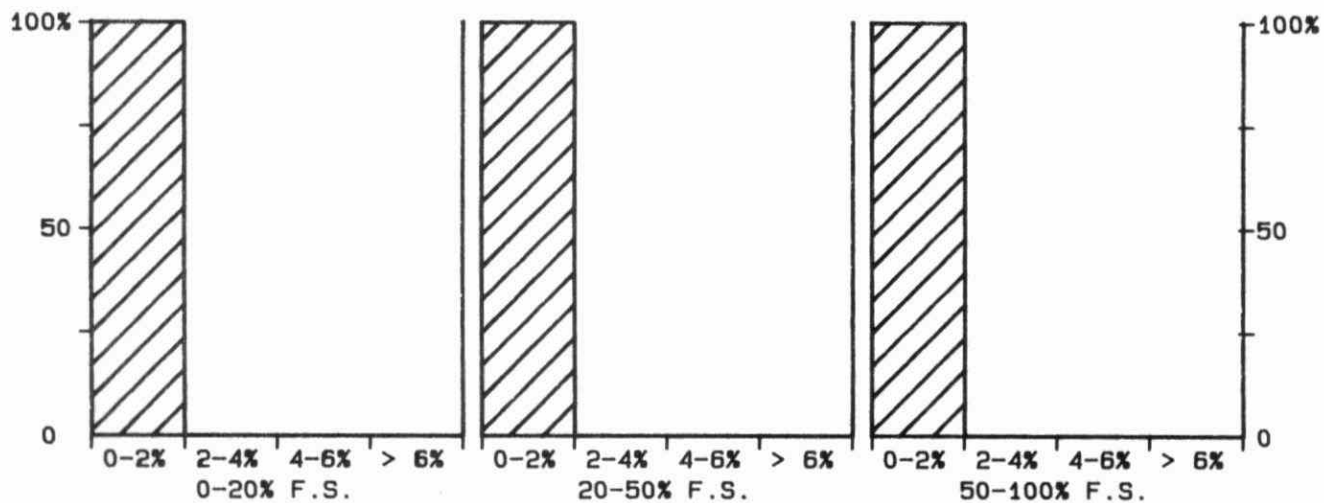
QUALITY CONTROL GRAPHS POTASSIUM (MG/L AS K)

FROM: 25/09/85

TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 10 MG/L AS K

POTASSIUM
QUALITY CONTROL DATA FROM 07/01/85 TO 10/09/85

Lab: Rivers and Lakes

Analytical Range: 0.12 to 1.00 mg/L as K

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	42	0.75	0.74	-0.01	0.016
b :	42	0.25	0.25	-0.00	0.013
a+b :	42	1.00	0.99	-0.01	0.023
a-b :	42	0.50	0.50	-0.00	0.018

s.d.(AB): S_w(within run): 0.013 S(between runs): 0.015 S/S_w: 1.15

On any given day the calibration is accepted if the values obtained lie within the ranges:

0.95 to 1.05 for A+B
 0.47 to 0.53 for A-B

DUPLICATES:

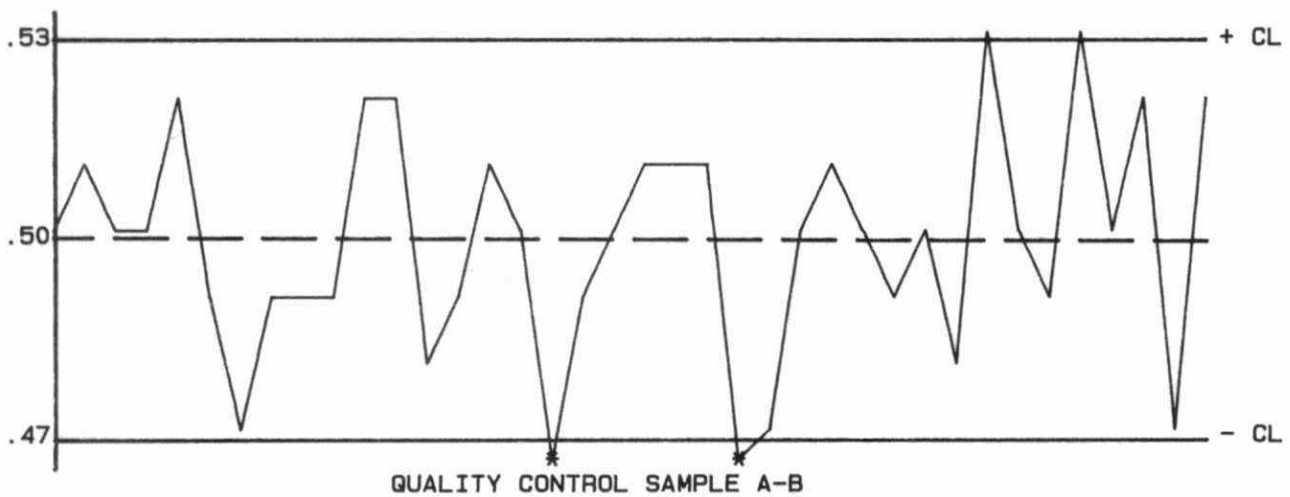
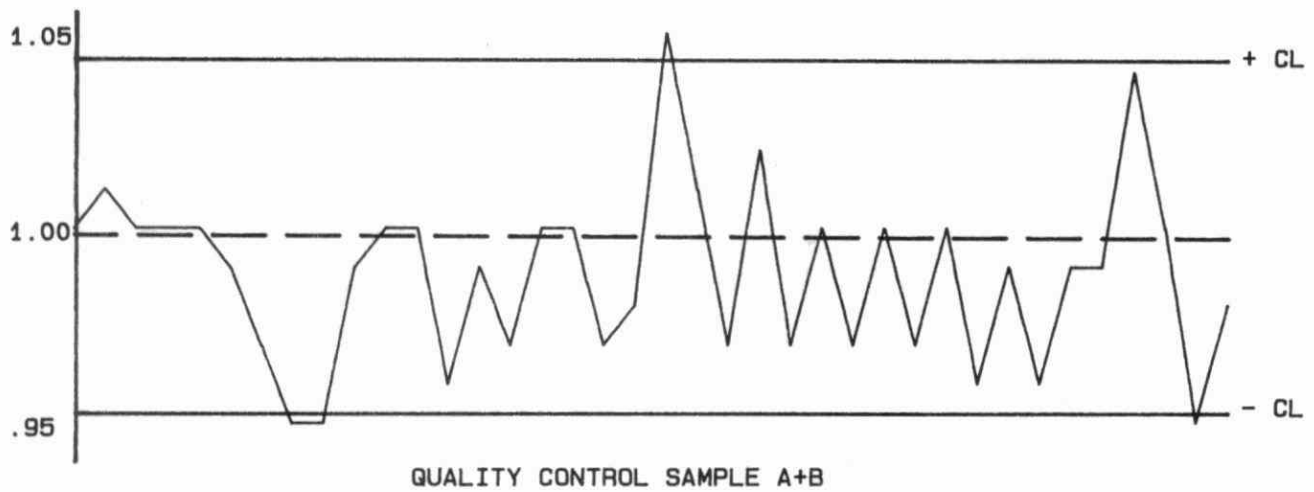
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
4	0.00 - 0.10	0.039	78.1
16	0.10 - 0.25	0.023	12.8
63	0.25 - 0.50	0.028	7.3
31	0.50 - 1.00	0.043	6.7
114	Overall	0.033	N/A

DETECTION CRITERION: 0.12**OTHER CHECKS:**

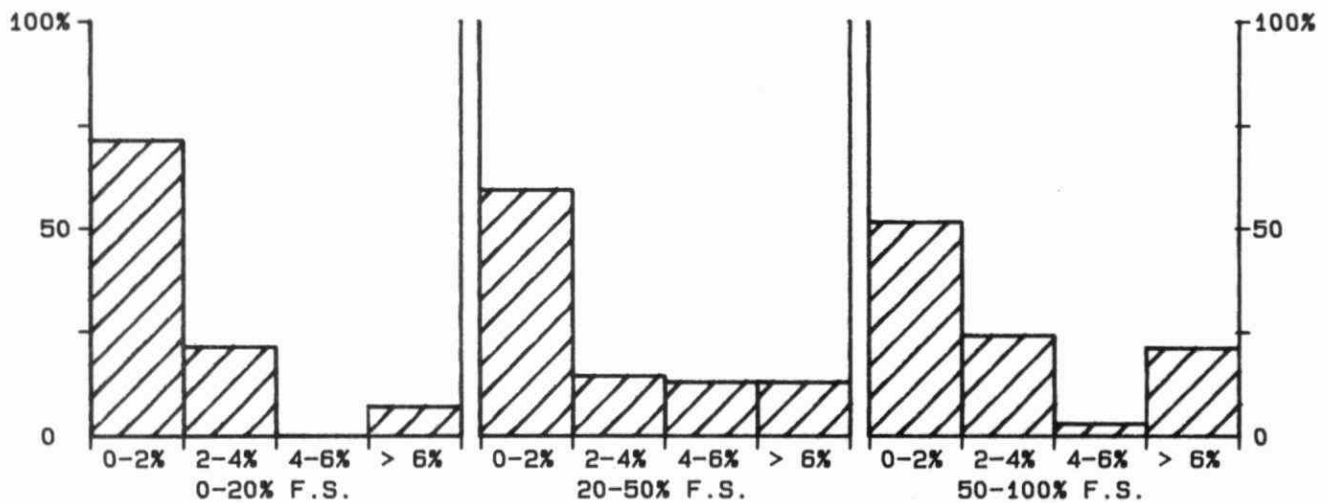
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	30	0.48	0.230
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS POTASSIUM (MG/L AS K)

FROM: 07/01/85
TO: 10/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



*** SILICON - REACTIVE SILICATES ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/02/75
LIS Test Name Code:	SIO3UR	Units	: mg/L as Si
Work Station Code	: RMSICL	Unit Code	: 064814
Method Code	: 001BC2	Supervisor	: J. Crowther

Sample Type/Matrix: Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates

SAMPLING:

Quantity Required: 50 mL
Container : Plastic

ANALYTICAL PROCEDURE:

Reactive silicates are determined by formation of a reduced molybdo-silicate complex at pH 1.6, using ascorbic acid as the reducing agent, and oxalic acid to suppress phosphate interference.

Approximate absorbance: 0.7 at the 5.0 mg/L as Si level.

N.B. Chloride is determined simultaneously.

INSTRUMENTATION:

Boxed-FIA system consisting of basic automated modular continuous flow system plus the following modules: sample injection valve with air-flow controls, timer, bubble-gate. Colourimetric measurement is through a 5.0 cm. light path at 660 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3

Minimum Increment (W) : 0.02

Detection Criterion (T): 0.04

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA, QCB/C, QCD

Drift : BL plus 4 standards

MODIFICATIONS:

04/07/83 - Modules required for Boxed-FIA system were introduced. The number of calibration standards was increased from 2 to 10. The analytical rate was tripled. Concentrations of QC standards adjusted accordingly.

27/03/85 - Silicon analytical range was changed from 0-5.00mg/L to 0-10.00mg/L. First three months' data were omitted because they were not comparable with the later ones.

NOTES:

Calibration standard is a hydrate: $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$

SILICON - REACTIVE SILICATES
QUALITY CONTROL DATA FROM 27/03/85 TO 30/12/85

ab: Rivers and Lakes

Analytical Range: 0.04 to 10.00 mg/L as Si

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	54	6.00	6.02	0.02	0.119
b :	54	1.60	1.63	0.03	0.041
a+b :	54	7.60	7.65	0.05	0.130
a-b :	54	4.40	4.38	-0.02	0.122
c :	53	1.60	1.62	0.02	0.026
d :	53	0.40	0.41	0.01	0.013
c+d :	53	2.00	2.03	0.03	0.031
c-d :	53	1.20	1.21	0.01	0.027

.d.(AB): Sw(within run): 0.086 S(between runs): 0.089 S/Sw: 1.03
.d.(CD): Sw(within run): 0.019 S(between runs): 0.021 S/Sw: 1.08

any given day the calibration is accepted if the values obtained lie within the ranges:

7.15 to 8.05 for A+B
4.10 to 4.70 for A-B
1.85 to 2.15 for C+D
1.10 to 1.30 for C-D

REPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	62	0.00 - 0.50	0.012	6.2
	37	0.50 - 1.00	0.096	13.1
	54	1.00 - 2.50	0.117	6.9
	31	2.50 - 5.00	0.109	3.3
	5	5.00 - 10.00	0.232	3.6
	189	Overall	0.095	N/A

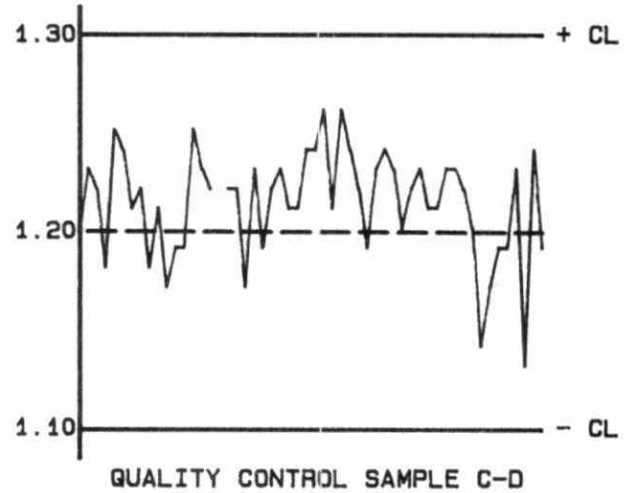
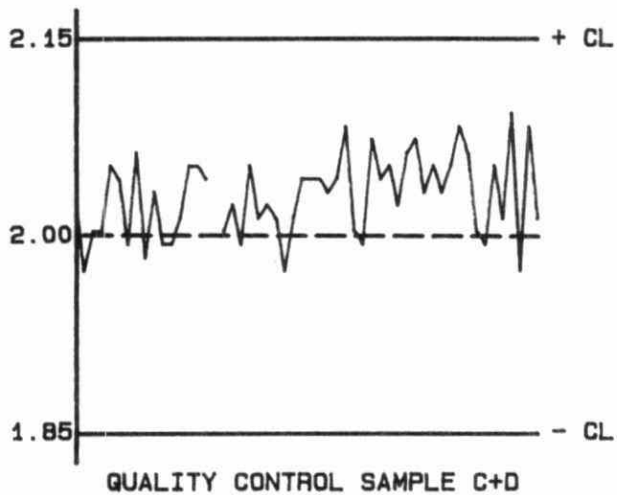
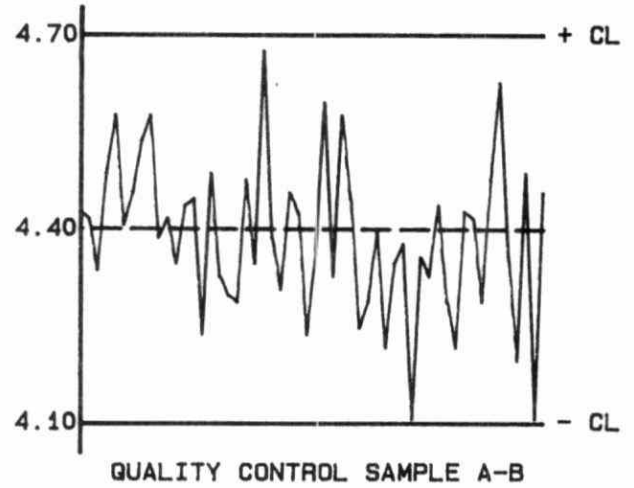
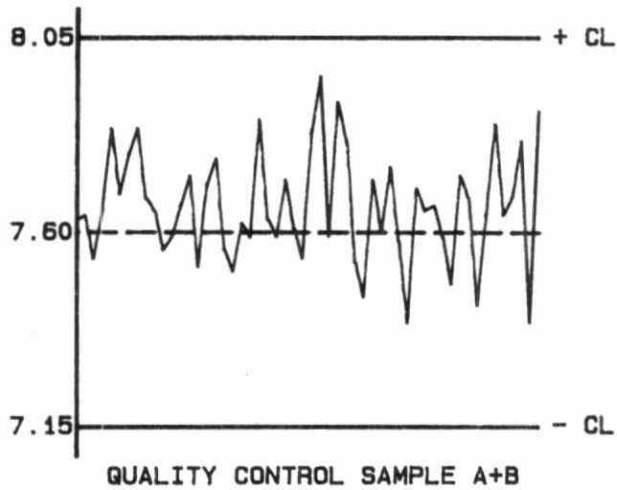
DETECTION CRITERION: 0.04

OTHER CHECKS:

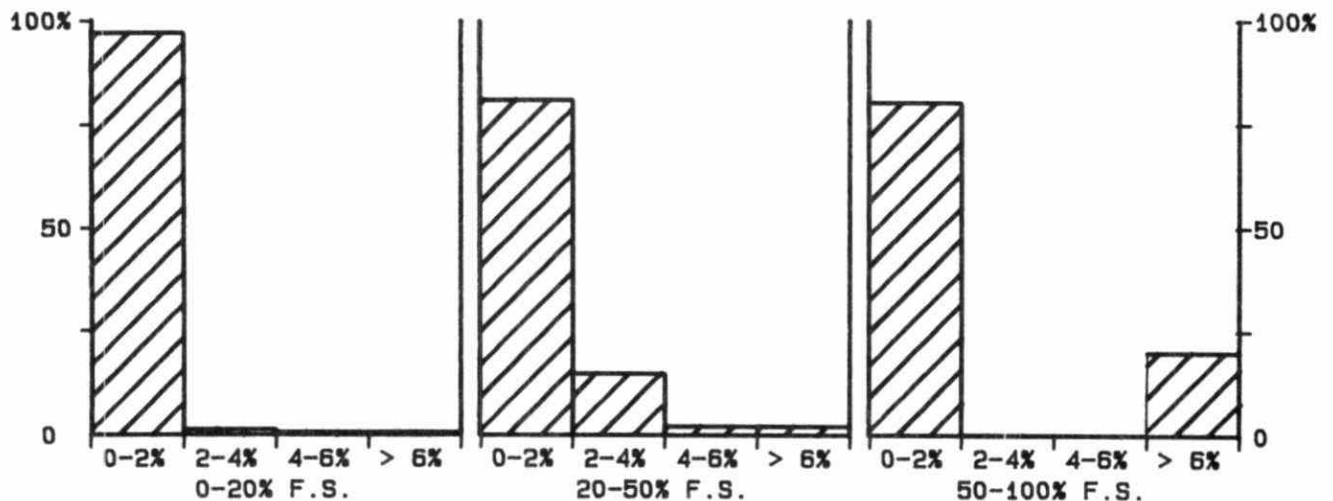
	Number of Data	Data Mean	Standard(1) Deviation
Std. Cal.	54	133	24.3
Long Term Blank	54	0.00	0.000

QUALITY CONTROL GRAPHS SILICON - REACTIVE SILICATES (MG/L AS SI)

FROM: 27/03/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



*** SODIUM ***

IDENTIFICATION:

Laboratory : Domestic Water Method Introduced: Before '74
LIS Test Name Code: NAUR Units : mg/L as Na
Work Station Code : WNAK Unit Code : 064811
Method Code : 002BA1 Supervisor : M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Effluents

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm using an air-acetylene flame. Potassium is added as a suppressant via an automated sampling train.
Approximate absorbance: 0.16 at the 50 mg/L level.

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS). Two analytical ranges are obtained from the output of the AAS.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.1 Detection Criterion (T):0.7

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : BL plus 3 standards

SODIUM
QUALITY CONTROL DATA FROM 02/01/85 TO 31/12/85

Lab: Domestic Water

Analytical Range: 0.7 to 200 mg/L as Na

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	98	130	129	-1	1.4
b :	98	33	33	0	0.7
a+b :	98	163	162	-1	1.5
a-b :	98	97	96	-1	1.5
c :	98	32.5	32.8	0.3	0.47
d :	98	6.5	6.7	0.2	0.26
c+d :	98	39.0	39.4	0.4	0.60
c-d :	98	26.0	26.1	0.1	0.47

s.d.(AB): Sw(within run): 1.1 S(between runs): 1.1 S/Sw: 1.04
 s.d.(CD): Sw(within run): 0.33 S(between runs): 0.38 S/Sw: 1.14

On any given day the calibration is accepted if the values obtained lie within the ranges:

154 to 172 for A+B
 91 to 103 for A-B
 36.0 to 42.0 for C+D
 24.0 to 28.0 for C-D

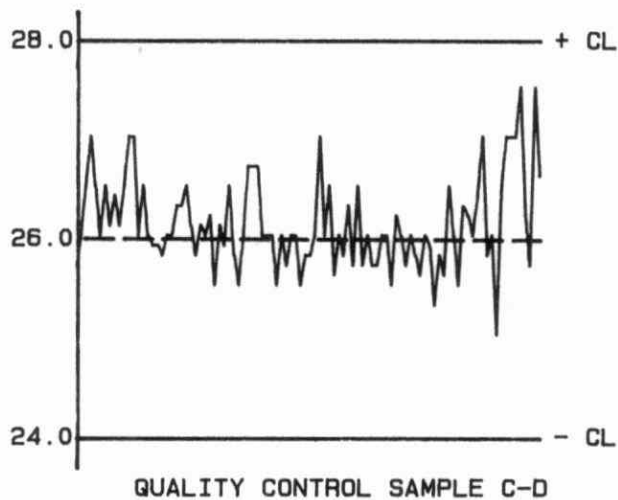
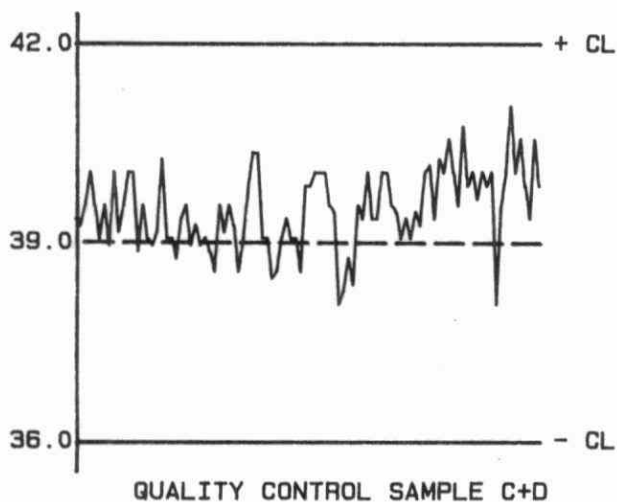
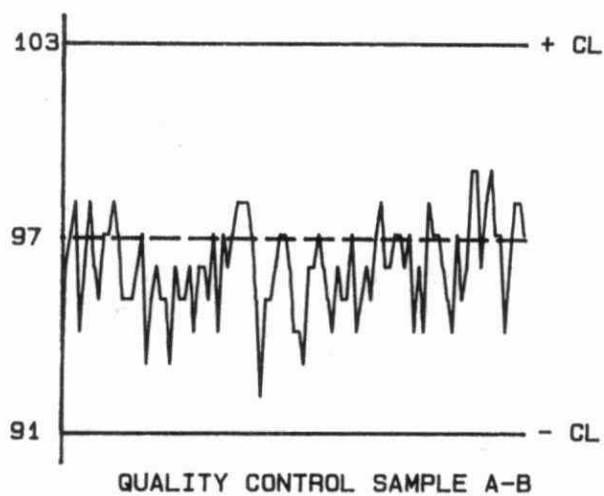
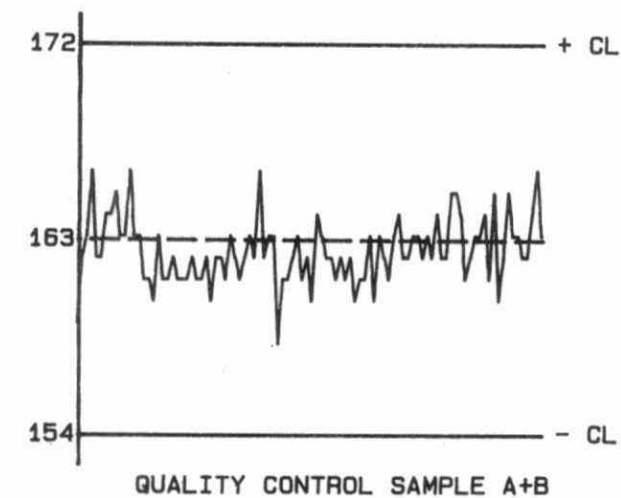
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	108	0.0 - 10.0	0.23	5.1
	61	10.0 - 20.0	0.29	2.1
	54	20 - 50	0.7	2.2
	31	50 - 100	0.8	1.2
	15	100 - 200	1.0	0.7
	269	Overall	0.5	N/A

DETECTION CRITERION: 0.7

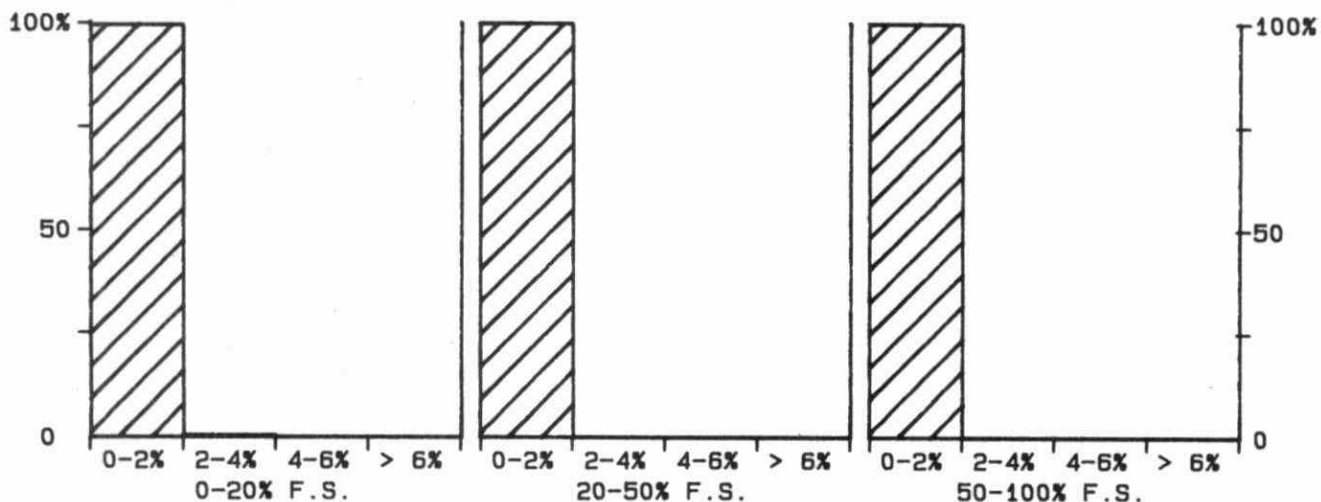
QUALITY CONTROL GRAPHS SODIUM (MG/L AS NA)

FROM: 02/01/85

TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 200 MG/L AS NA

*** SODIUM ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	18/05/79
LIS Test Name Code:	NAUR	Units	: mg/L as Na
Work Station Code	: PRAA	Unit Code	: 064811
Method Code	: 002EA1	Supervisor	: M. Rawlings
Sample Type/Matrix: Precipitation, Throughfall, Stemflow.			

SAMPLING:

Quantity Required: 5 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Samples are analysed by AAS at 589.0 nm with an air-acetylene flame. Potassium is added as a suppressant via an automated sampling train.
Approximate absorbance: 0.5 at the 1.00 mg/L level.

INSTRUMENTATION:

Automated modular flow injection atomic absorption spectrophotometer(AAS) system

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.005	Detection Criterion (T): 0.016

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL every 10 samples; 2 standards every 20 samples

MODIFICATIONS:

17/05/85 - Three additional calibration standards were set up. Flow injection introduction of sample was adopted. System was further automated with the addition of a microcomputer to co-ordinate sampler, injection, AAS "read", and data reduction. Sample required reduced to 5mL.

SODIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 20/12/85

Lab: Precipitation

Analytical Range: 0.016 to 1.00 mg/L as Na

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	75	0.600	0.605	0.005	0.0090
b :	77	0.100	0.102	0.002	0.0099
a+b :	75	0.700	0.707	0.007	0.0149
a-b :	75	0.500	0.503	0.003	0.0113

s.d.(AB): Sw(within run): 0.0080 S(between runs): 0.0095 S/Sw: 1.18

In any given day the calibration is accepted if the values obtained lie within the ranges:

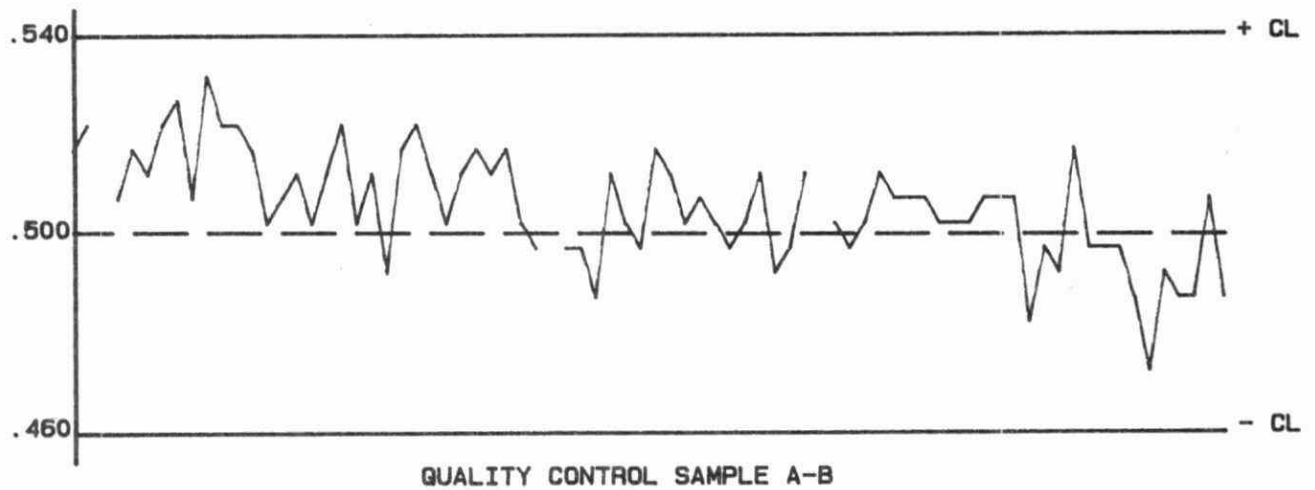
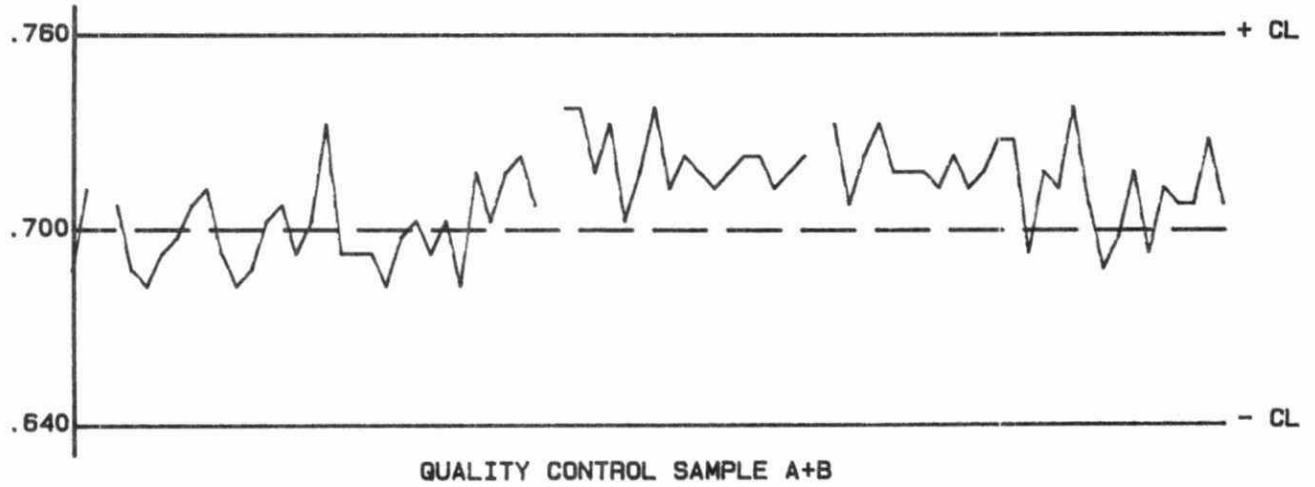
0.640 to 0.760 for A+B
 0.460 to 0.540 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	123	0.000 - 0.100	0.0053	12.6
	20	0.100 - 0.200	0.0086	6.7
	30	0.20 - 1.00	0.010	2.1
	173	Overall	0.007	N/A

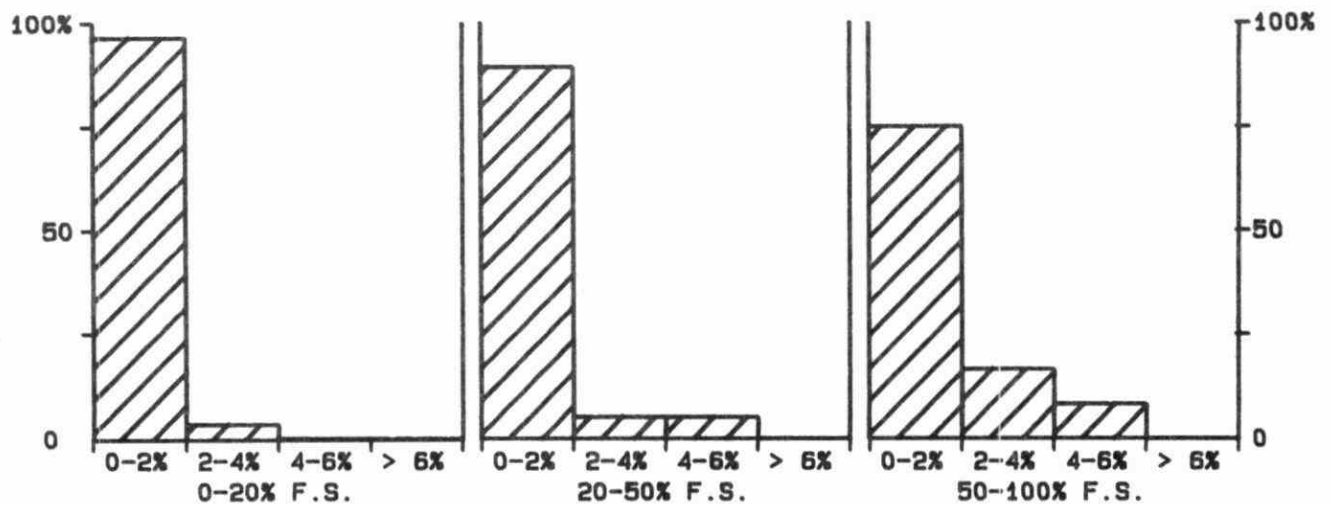
DETECTION CRITERION: 0.016

QUALITY CONTROL GRAPHS SODIUM (MG/L AS NA)

FROM: 03/01/85
TO: 20/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1 MG/L AS NA

*** SODIUM ***

IDENTIFICATION:

Laboratory : Rivers and Lakes Method Introduced: 01/04/74
LIS Test Name Code: NAUR Units : mg/L as Na
Work Station Code : RMAAS Unit Code : 064811
Method Code : 002CA1,002DA1 Supervisor : J. Crowther
Sample Type/Matrix: Rivers, Lakes, Soil Extracts, Effluents.

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm using an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.
Approximate absorbance: RMAAS : 1.07

INSTRUMENTATION:

Automated modular continuous flow atomic absorption system(AAS).

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T):0.08*,0.20,0.08

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration : LTBL plus 2 standards, eg, QCA for each analytical range
Drift : BL plus 1 standard for each analytical range

MODIFICATIONS:

01/12/81- Calibration range became 10.0 mg/L full scale; second analytical range was dropped.
01/03/84- Analytical range(RMNAKL) was added; full scale:2.00 mg/L. This range is currently restricted to special programs.
01/09/84- Analytical range(RMNAKH) was increased from 10.0 to 20.0 mg/L full scale. Calibration technique was changed from quadratric to linear interpolation. Potassium is no longer determined simultaneously.
25/09/85- Calibration range remains at 20.0 mg/L full scale but second analytical range was dropped. Concentrations of QC standards were adjusted accordingly. Microcomputer controlled system.

NOTES:

Three analytical ranges were used during 1985: 2.00, 20.0, and 20.0 mg/L full scale as Na. Corresponding detection criteria are given above.
*T value is based on duplicate analyses at concentrations above the lowest range.

SODIUM
QUALITY CONTROL DATA FROM 03/01/85 TO 09/09/85

Lab: Rivers and Lakes

Analytical Range: 0.20 to 20.00 mg/L as Na

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	37	15.00	15.12	0.12	0.318
b :	37	5.00	5.04	0.04	0.214
a+b :	37	20.00	20.16	0.16	0.437
a-b :	37	10.00	10.07	0.07	0.320

s.d.(AB): Sw(within run): 0.226 S(between runs): 0.271 S/Sw: 1.20

On any given day the calibration is accepted if the values obtained lie within the ranges:

19.10 to 20.90 for A+B
 9.40 to 10.60 for A-B

DUPLICATES:

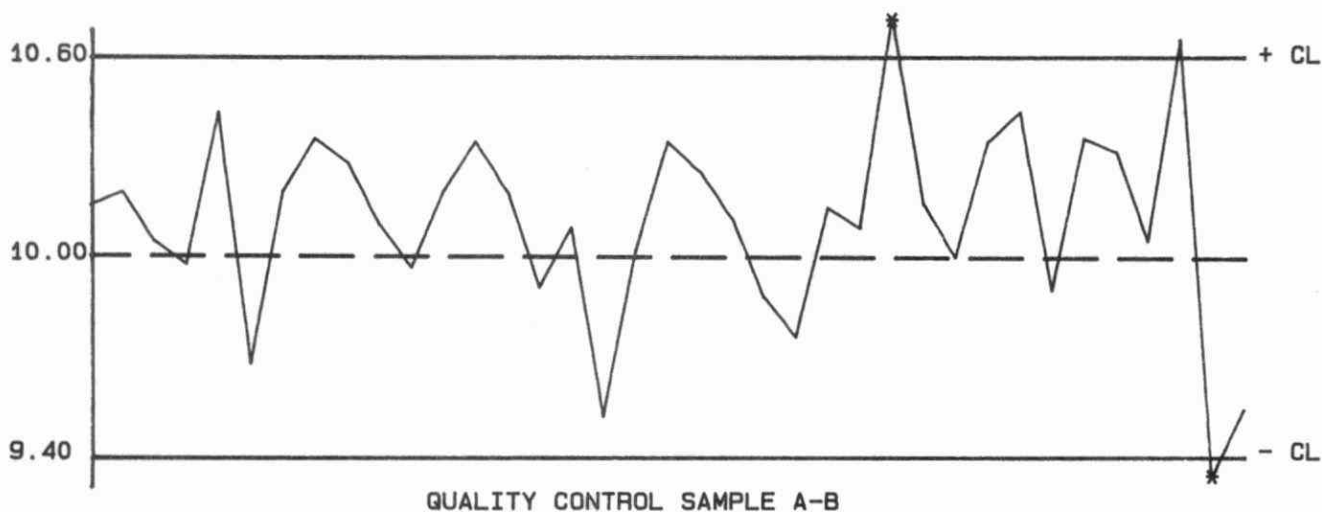
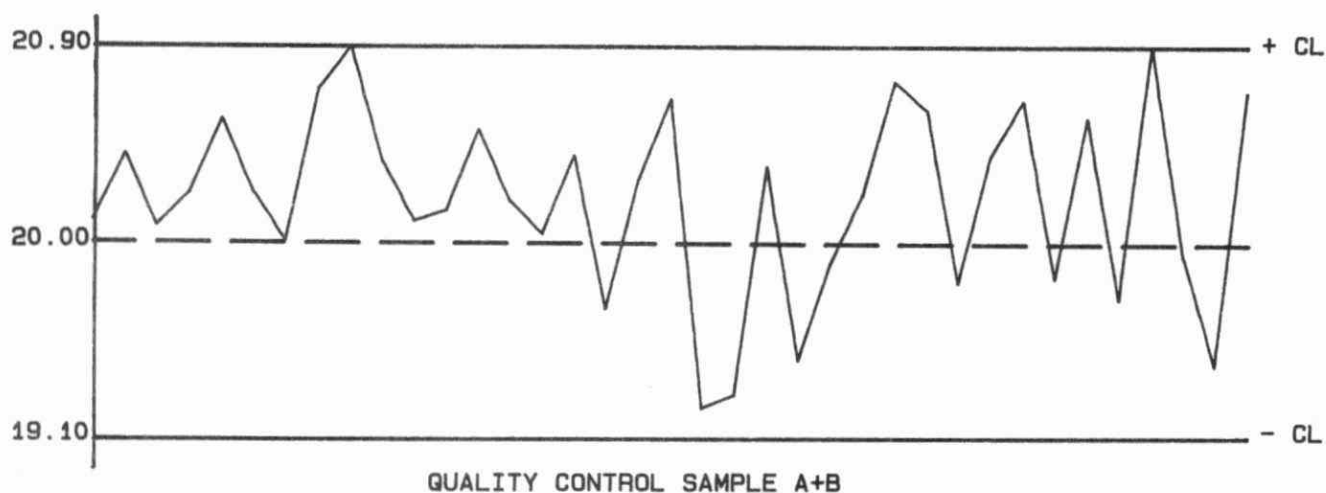
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
45	0.00 - 1.00	0.068	12.1
15	1.00 - 2.00	0.088	5.8
14	2.00 - 5.00	0.144	5.0
9	5.00 - 10.00	0.121	1.8
8	10.00 - 20.00	0.379	2.3
91	Overall	0.144	N/A

DETECTION CRITERION: 0.20**OTHER CHECKS:**

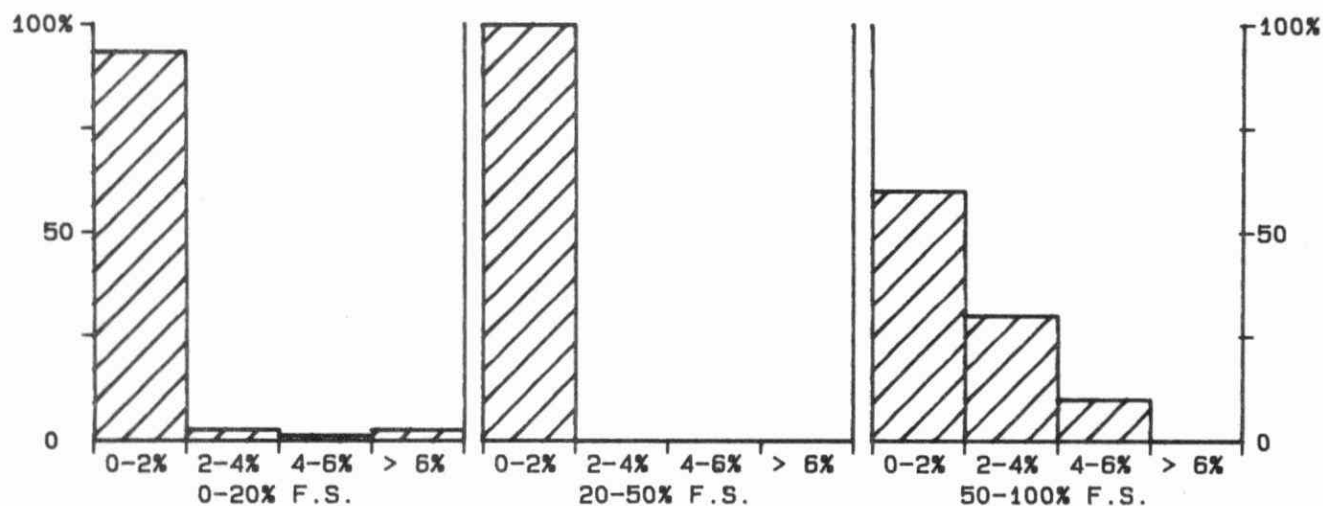
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	30	1.01	0.100
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS SODIUM (MG/L AS NA)

FROM: 03/01/85
TO: 09/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 MG/L AS NA

SODIUM
QUALITY CONTROL DATA FROM 02/10/85 TO 30/12/85

Lab: Rivers and Lakes

Analytical Range: 0.00 to 20.00 mg/L as Na

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	23	16.00	16.00	0.00	0.301
b :	23	1.40	1.40	0.00	0.038
a+b :	23	17.40	17.41	0.01	0.304
a-b :	23	14.60	14.60	0.00	0.302

s.d.(AB): Sw(within run): 0.214 S(between runs): 0.215 S/Sw: 1.00

On any given day the calibration is accepted if the values obtained lie within the ranges:

16.50 to 18.30 for A+B
 14.00 to 15.20 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	44	0.00 - 1.00	0.026	3.9
	16	1.00 - 2.00	0.051	3.6
	6	2.00 - 4.00	0.092	3.0
	3	4.00 - 10.00	0.417	7.2
	1	10.00 - 20.00	N/A	N/A
	70	Overall	0.116	N/A

DETECTION CRITERION: 0.00

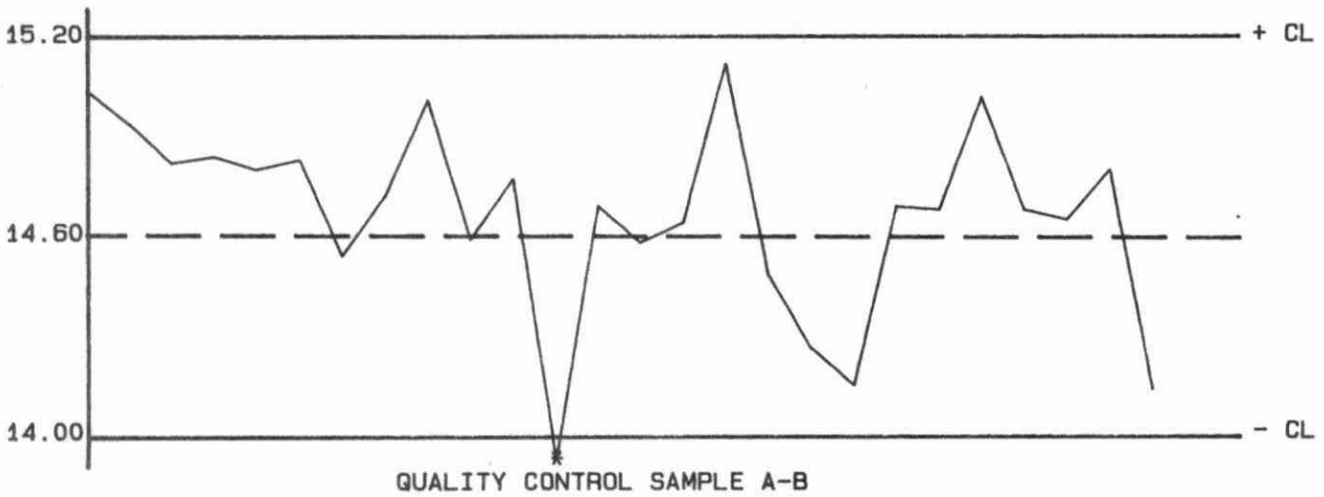
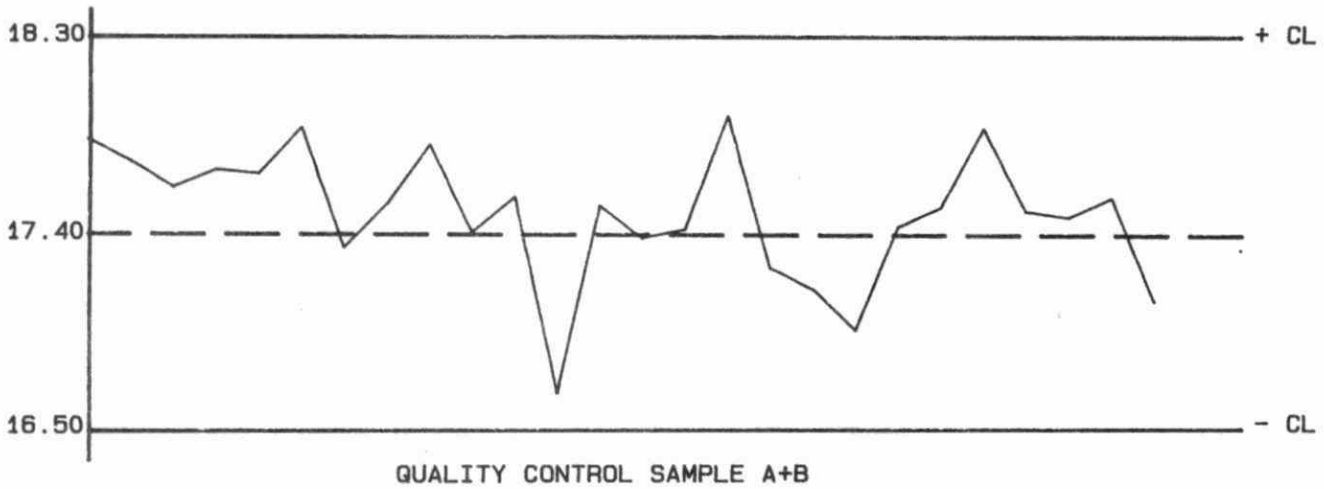
OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	0	N/A	N/A
Long Term Blank :	0	N/A	N/A

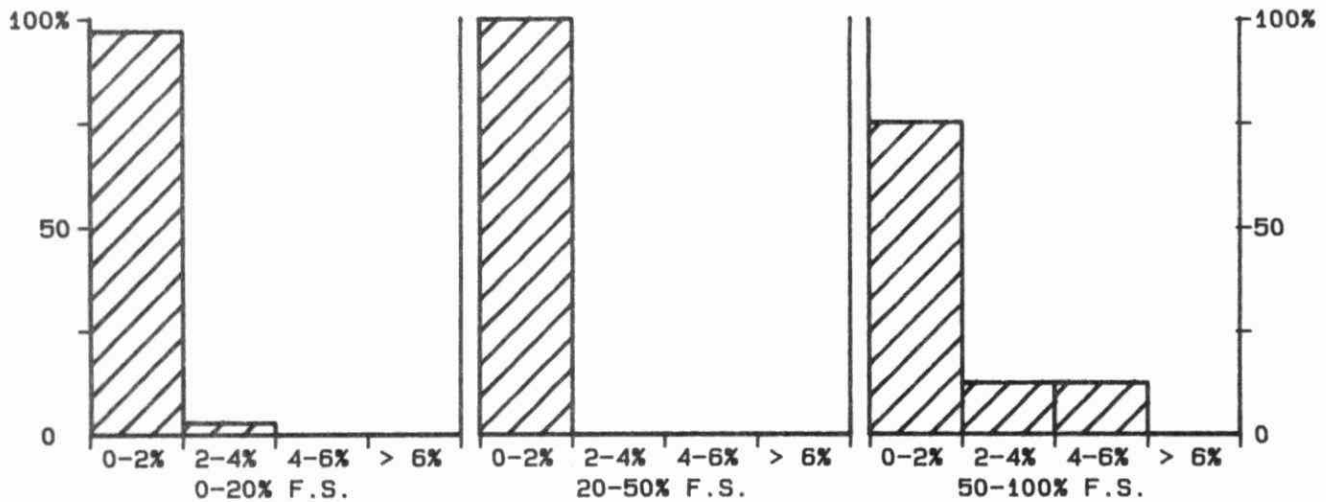
QUALITY CONTROL GRAPHS

SODIUM (MG/L AS NA)

FROM: 25/09/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 20 MG/L AS NA

SODIUM
QUALITY CONTROL DATA FROM 07/01/85 TO 10/09/85

Lab: Rivers and Lakes

Analytical Range: N/A to 2.00 mg/L as Na

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	39	1.50	1.50	0.00	0.027
b :	39	0.50	0.50	-0.00	0.023
a+b :	39	2.00	2.00	-0.00	0.039
a-b :	39	1.00	1.00	0.00	0.032

s.d.(AB): Sw(within run): 0.023 S(between runs): 0.025 S/Sw: 1.11

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.91 to 2.09 for A+B
 0.94 to 1.06 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	1	0.00 - 0.20	N/A	N/A
	15	0.20 - 0.50	0.026	6.0
	66	0.50 - 1.00	0.037	5.3
	23	1.00 - 2.00	0.057	4.1
	105	Overall	0.041	N/A

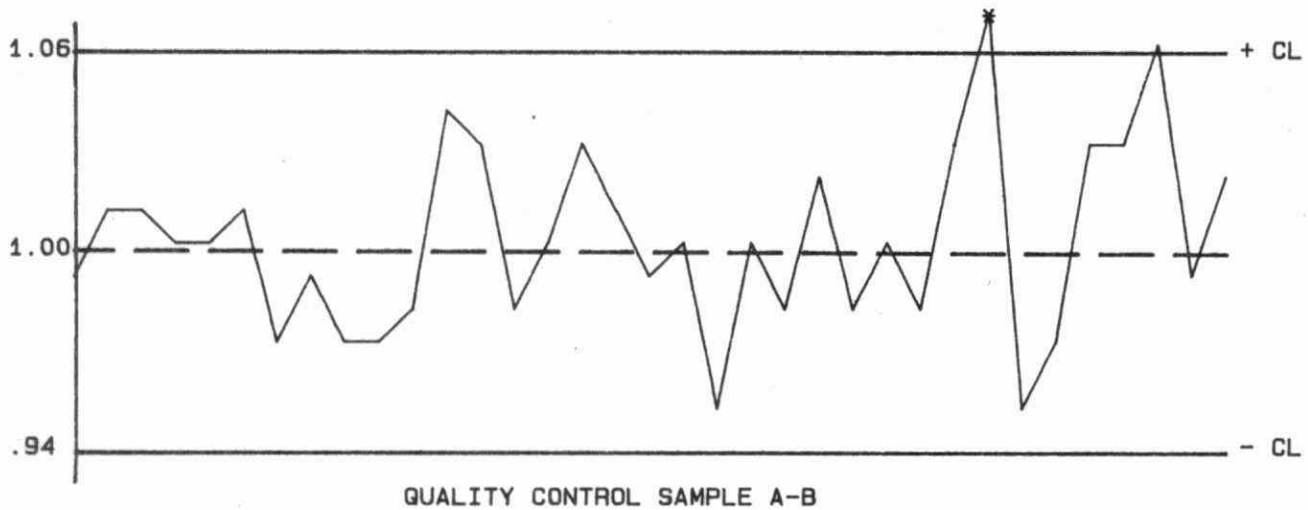
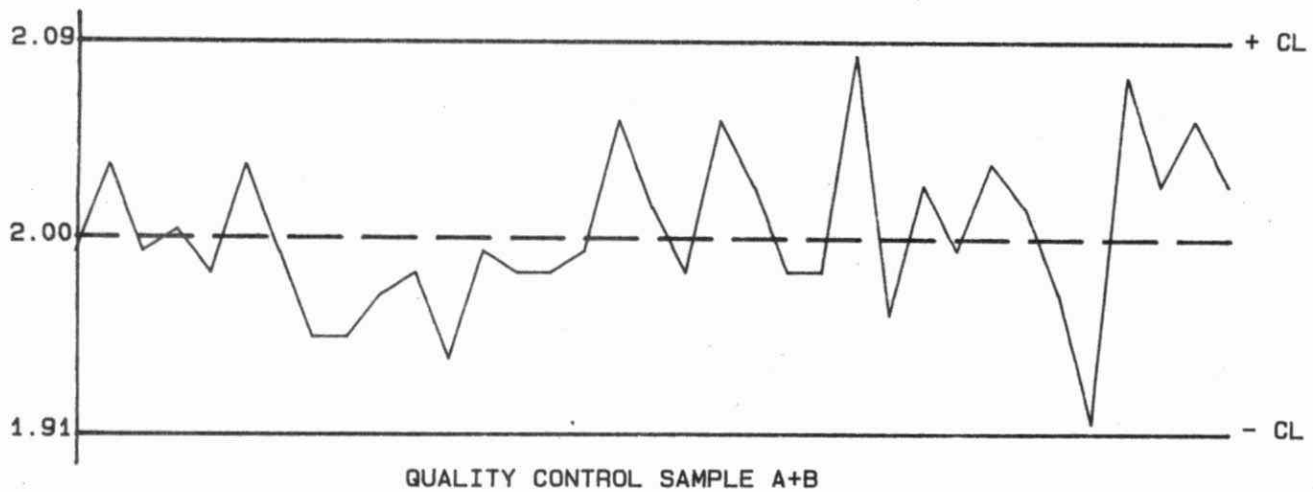
DETECTION CRITERION: N/A

OTHER CHECKS:

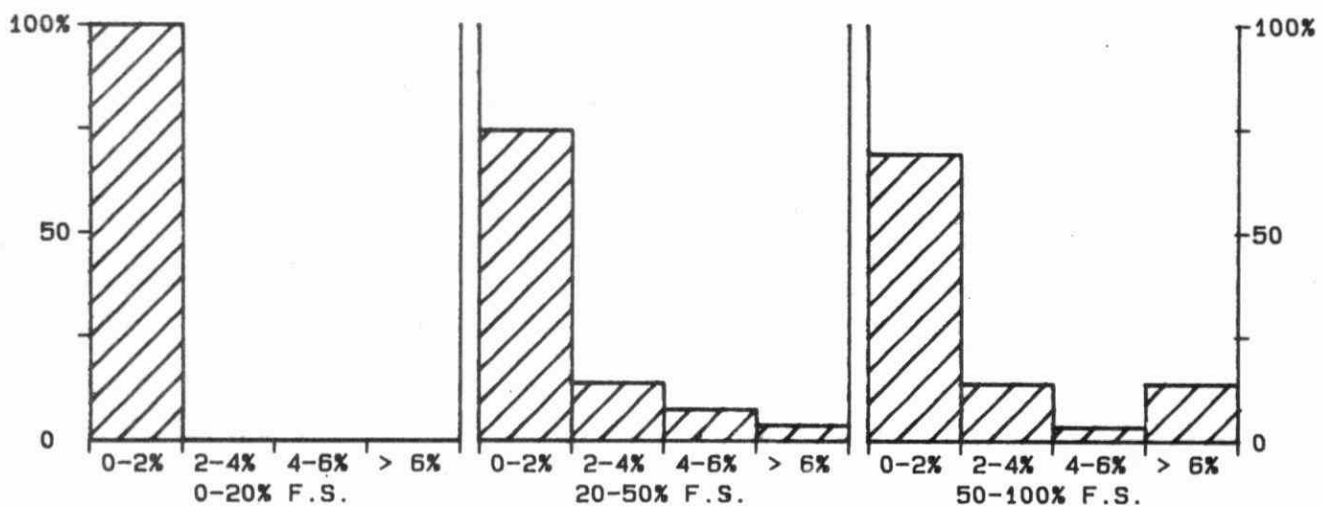
	Number of Data	Data Mean	Standard(1) Deviation
Absorbance :	33	0.96	0.084
Long Term Blank :	0	N/A	N/A

QUALITY CONTROL GRAPHS SODIUM (MG/L AS NA)

FROM: 07/01/85
TO: 10/09/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 2 MG/L AS NA

*** SOLIDS - DISSOLVED ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	RSF	Units	: mg/L
Work Station Code	: RMTSD	Unit Code	: 064000
Method Code	: 101A15	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Effluents			

SAMPLING:

Quantity Required: 75 mL
 Container : Glass or plastic

ANALYTICAL PROCEDURE:

Sample (shaken) is filtered under moderate suction through a Whatman 934AH glass fibre filter. 50.0 mL of filtrate is pipetted into a preweighed ceramic dish, dried at 103 to 105 C, and stored in a desiccator until cool. After reweighing the dissolved residue or solids content is calculated by difference. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance(4/5-decimal places), drying oven, suction filtration apparatus, ceramic dishes
 -Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.5 Detection Criterion (T): Not applicable*

CALIBRATION:

Balance zero and 1 built-in calibration weight

CONTROLS:

Calibration : 2 S class weights, eg, QCA
 Recovery : LTBL plus 2 standards, eg, R1
 Drift : Balance zero is checked frequently

MODIFICATIONS:

15/01/82- QC program was expanded to include recovery standards
 01/05/84- Microcomputer control was introduced

NOTES:

*Dissolved solids in surface waters normally are estimated when the conductivity of the sample is less than 400 uS/cm:

$$\text{Dissolved solids (mg/L)} = 0.65 \times \text{Conductivity (uS/cm)}$$

Hence, few data from direct measurements at low concentrations are available to calculate the detection criterion of this gravimetric test.

SOLIDS - DISSOLVED
QUALITY CONTROL DATA FROM 13/02/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: N/A to 1000 mg/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	153	50.0000	50.0002	0.0002	0.00020
b :	153	10.0000	10.0001	0.0001	0.00008
a+b :	153	60.0000	60.0002	0.0002	0.00024
a-b :	153	40.0000	40.0001	0.0001	0.00018

s.d.(AB): Sw(within run): 0.00013 S(between runs): 0.00015 S/Sw: 1.20

On any given day the calibration is accepted if the values obtained lie within the ranges:

59.998 to 60.001 for A+B
 39.998 to 40.001 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	116	800	800	15.5
r2 :	116	300	305	14.4

DUPLICATES:

	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
2		0 - 50	3.6	7.9
3		50 - 100	5.2	8.2
23		100 - 250	8.4	4.4
164		250 - 500	11.6	3.3
25		500 - 1000	9.2	1.4
217		Overall	10.9	N/A

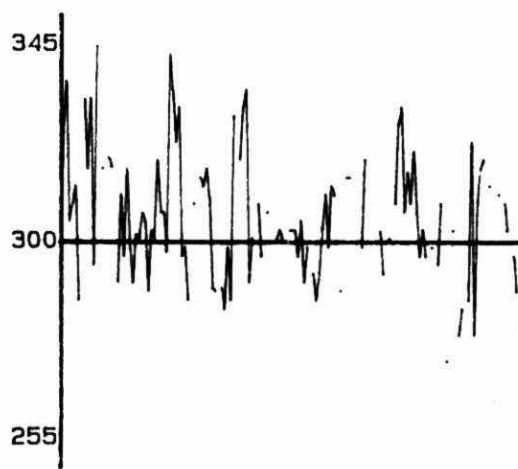
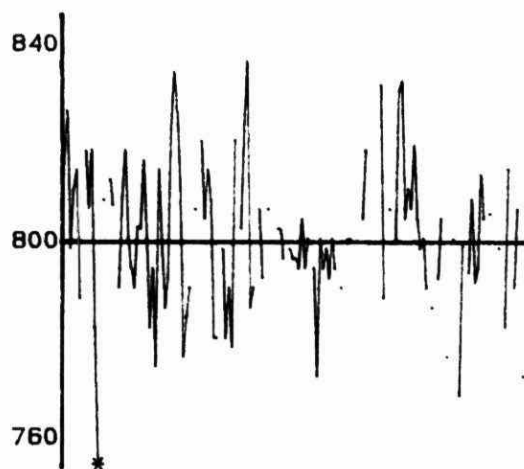
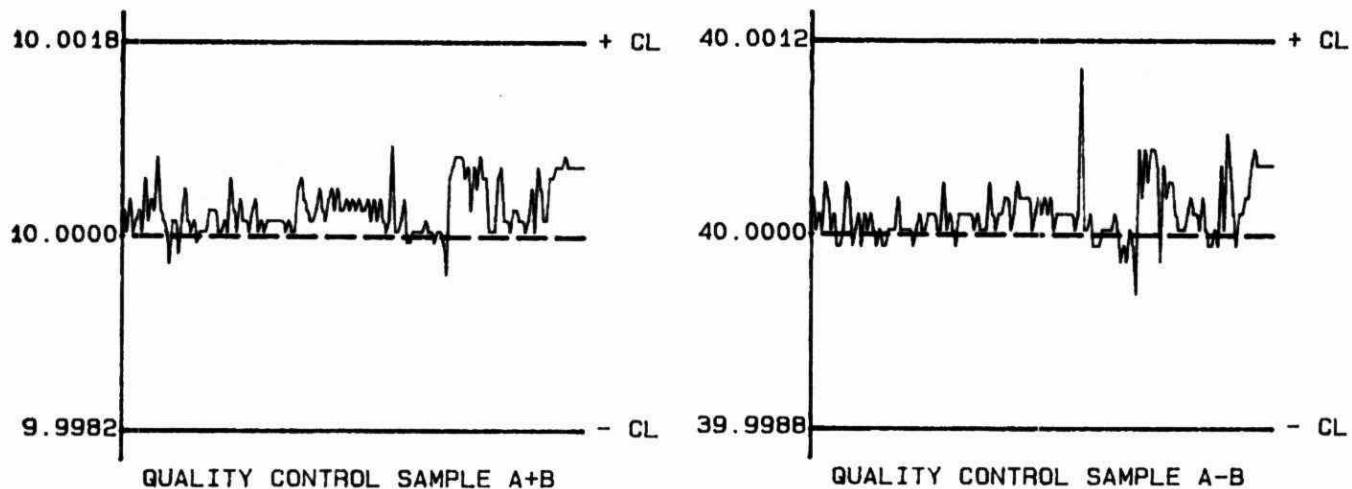
DETECTION CRITERION: N/A**OTHER CHECKS:**

	Number of Data	Data Mean	Standard(1) Deviation
Blank :	58	1.61	7.513

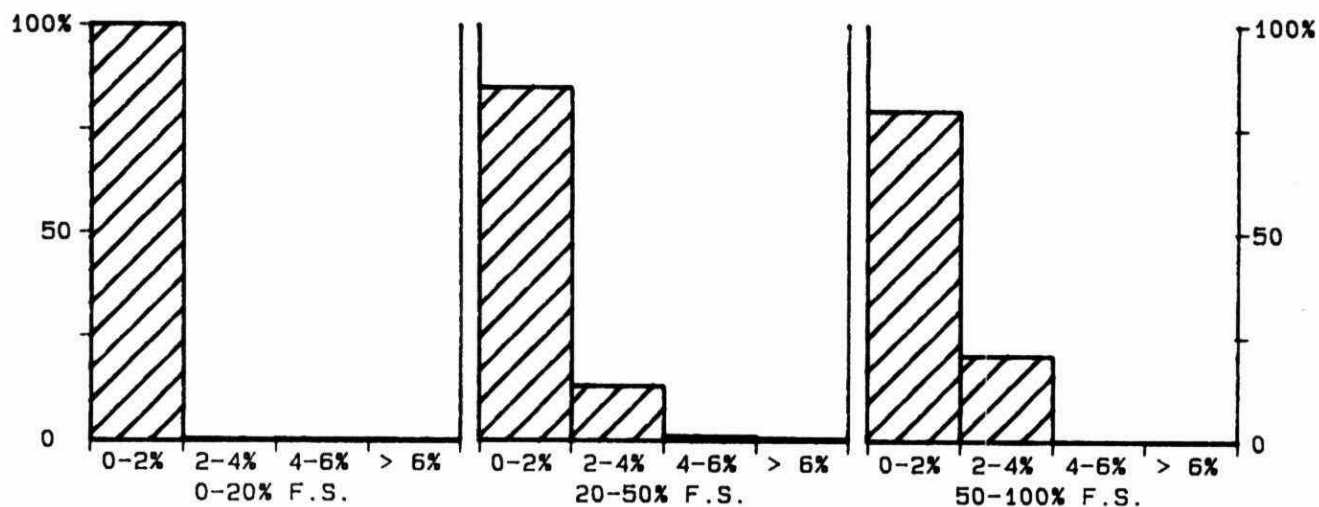
QUALITY CONTROL GRAPHS SOLIDS - DISSOLVED (MG/L)

FROM: 13/02/85

TO: 31/12/85



* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 1000 MG/L

*** SOLIDS - DISSOLVED ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: Before '61
LIS Test Name Code: RSF Units : mg/L
Work Station Code : SOLIDS Unit Code : 064000
Method Code : 101A15 Supervisor : P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Leachate, Domestic Waters,
Effluents

SAMPLING:

Quantity Required: 125 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH glass fibre filter. 50 or 100 mL of filtrate is pipetted into a preweighed Teflon dish, dried at 103 to 105 C, and stored in a dessicator until cool. After reweighing the dissolved residue or solids content is calculated by difference. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance(4/5-decimal places), drying oven, suction filtration apparatus, Teflon dishes
Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.5 Detection Criterion (T): 9.2

CALIBRATION:

Balance zero and 1 built-in calibration weight

CONTROLS:

Calibration : 2 S class weights, eg, QCA
Recovery : LTBL plus 2 standards, eg, R1
Drift : Balance zero is checked at least 4 times daily

MODIFICATIONS:

15/01/82- Microcomputer control was introduced

NOTES:

As the same two balances are used for all solids analyses in the Sewage/Industrial laboratory, the calibration control data are only listed once: in the Solids-Total report.

No data summary is available for period not covered in performance report.

SOLIDS - DISSOLVED
QUALITY CONTROL DATA FROM 01/02/85 TO 18/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 9.2 to 3000 mg/L

RECOVERIES:	Number of Data	Expected Concn	Av. Conc. Measured	Standard(1) Deviation
r1 :	30	2000	2004	8.2
r2 :	30	500	502	3.8

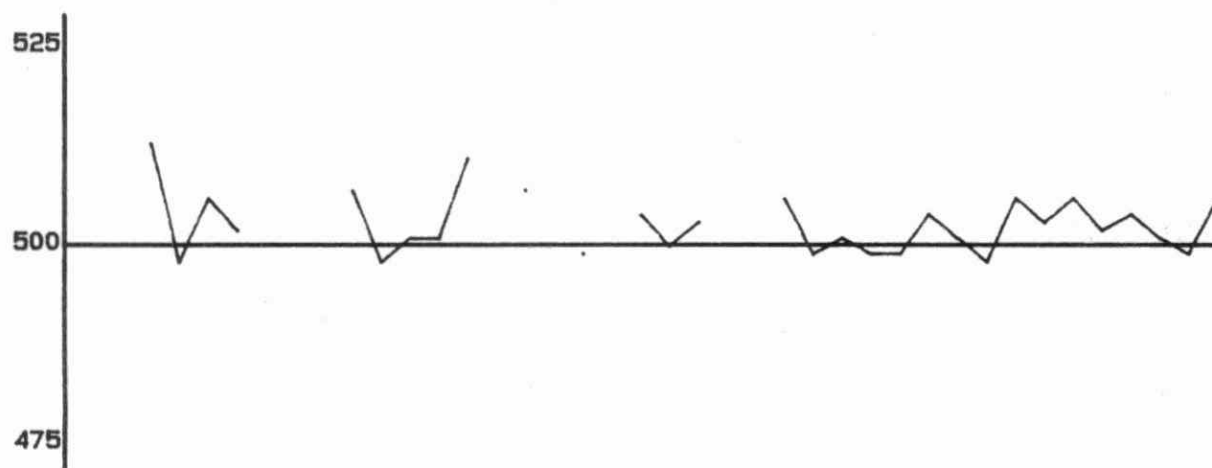
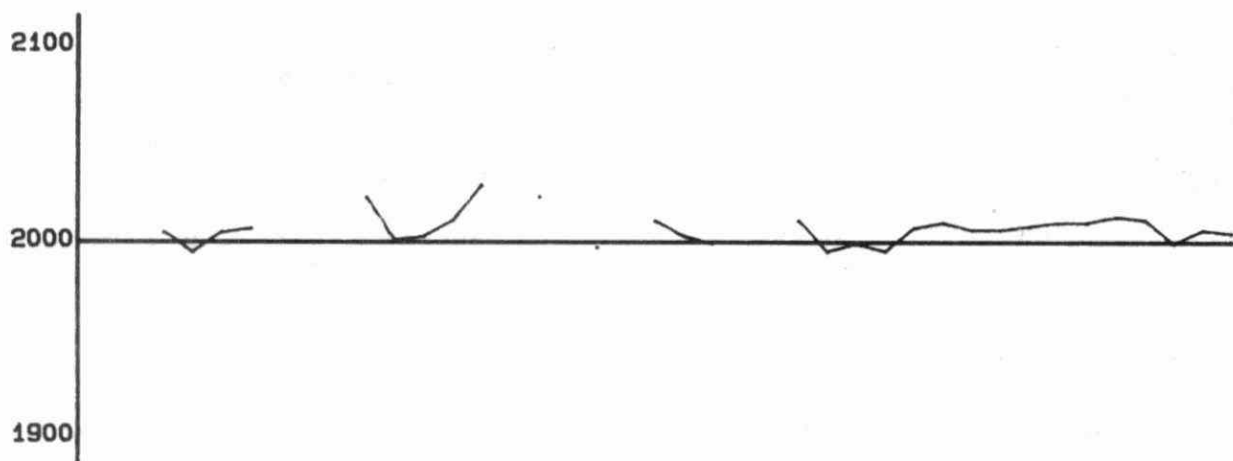
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	5	0.0 - 200.0	3.06	2.0
	11	200 - 400	4.8	1.7
	5	400 - 600	7.5	1.6
	7	600 - 1000	4.7	0.6
	1	1000 - 3000	N/A	N/A
	29	Overall	6.5	N/A

DETECTION CRITERION: 9.2

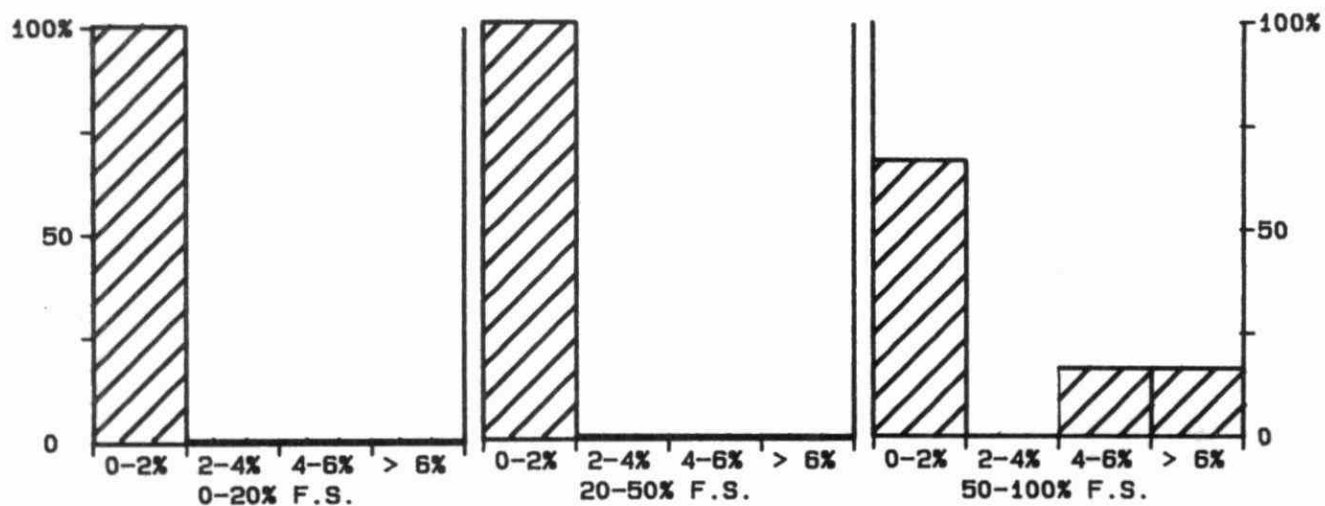
OTHER CHECKS:	Number of Data	Data Mean	Standard(1) Deviation
Blank :	28	0.07	5.959

QUALITY CONTROL GRAPHS SOLIDS - DISSOLVED (MG/L)

FROM: 01/02/85
TO: 18/12/85



--- EXPECTED VALUE
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 3000 MG/L

*** SOLIDS - IGNITED ***

IDENTIFICATION:

Laboratory : Sewage/Industrial Method Introduced: Before '61
 LIS Test Name Code: RSFA,RSPA,RSTA Units : mg/L or mg/Kg
 Work Station Code : SOLIDS Unit Code : 064000
 Method Code : 101A15,201A15,001A15 Supervisor : P. Campbell
 Sample Type/Matrix: Sewage, Industrial Waste, Domestic Waters, Leachate,
 Effluents

SAMPLING:

Quantity Required: 75-500 mL
 Container : Glass or plastic

ANALYTICAL PROCEDURE:

The procedure for dissolved, particulate, or total solids is followed and the dried residue is ignited at 600 C for one hour in a muffle furnace. As soon as practical the dish is transferred to a desiccator to cool. The ignited or ash weight is obtained as the difference between the final ignited weight and the original dish weight. Similarly the volume used in the ignited calculations is the volume selected for the original dried solids measurement. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance(4/5 decimal places), muffle furnace, ceramic dishes, Petri dishes
 -Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 1,0.1,0.5 Detection Criterion (T): 6,18.6*,52

CALIBRATION:

Balance zero and 1 built-in calibration weight

CONTROLS:

Calibration : 4 S class weights, eg, QCA
 Drift : Balance zero is checked at least 4 times daily

MODIFICATIONS:

01/05/82 Microcomputer control was introduced

NOTES:

-In the order listed above, W and T values refer to the residual ash after ignition of the dried residual from dissolved, particulate, and total solids determinations.
 -Duplicate data refer to ash residuals rather than loss on ignition.
 -Detection criteria estimates are unreliable due to limited data; samples requiring these tests are usually sewage sludges with high solids contents.
 -As the same two balances are used for all solids analyses in the Sewage/Industrial laboratory, the calibration control data are only listed once: in the Solids-Total report for Ignited Dissolved and Ignited Total tests, and in the Solids-Particulate report for Ignited Particulate tests.
 *T value is based on duplicate data above the lowest range.

SOLIDS - DISSOLVED IGNITED
QUALITY CONTROL DATA FROM 07/01/85 TO 18/12/85

Lab: Sewage and Industrial Waste

Analytical Range: - to 3000 mg/L

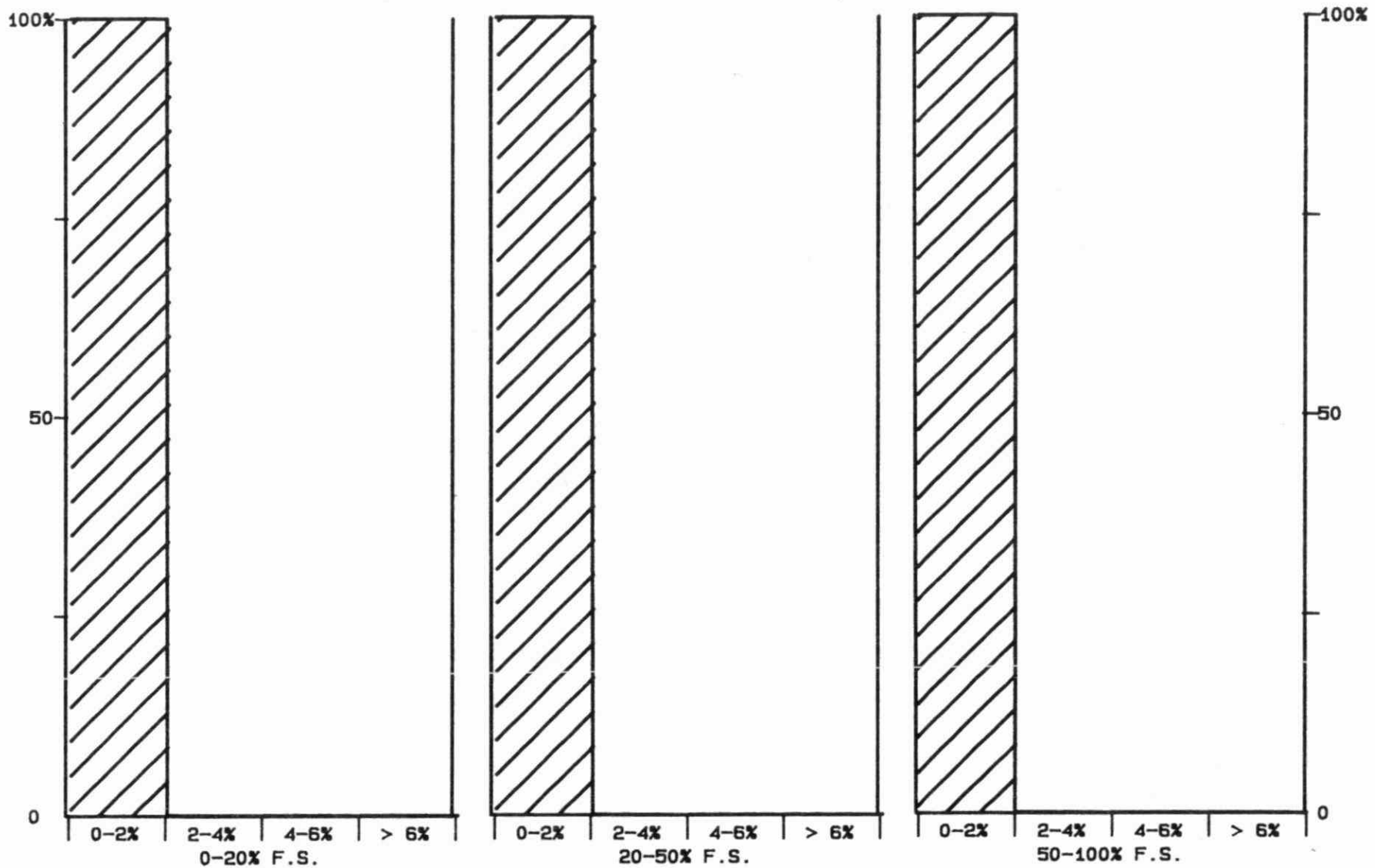
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	-----	-----	-----	-----
	8	0 - 200	1.99	1.4
	4	200 - 400	5.3	1.8
	5	400 - 600	9.8	2.0
	10	600 - 1000	9.3	1.2
	12	1000 - 3000	19.9	1.5
	39	Overall	12.6	N/A

DETECTION CRITERION: 6.0

OTHER CHECKS:	Number of Data	Data Mean	Standard(1) Deviation
	-----	-----	-----
Blank :	38	0.52	8.342

QUALITY CONTROL GRAPH
SOLIDS - DISSOLVED IGNITED (MG/L)

FROM: 07/01/85
TO: 18/12/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 3000 MG/L

SOLIDS - PARTICULATE IGNITED
QUALITY CONTROL DATA FROM 07/01/85 TO 23/12/85

ab: Sewage and Industrial Waste

Analytical Range: - to 3000 mg/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	67	0.50002	0.49999	-0.00003	0.000019
b :	67	0.05002	0.04999	-0.00003	0.000015
a+b :	67	0.55004	0.54998	-0.00006	0.000028
a-b :	67	0.45000	0.45000	-0.00000	0.000019

d.(AB): Sw(within run):0.000013 S(between runs):0.000017 S/Sw: 1.27

any given day the calibration is accepted if the values obtained lie within the ranges:

0.5470 to 0.5530 for A+B
 0.4480 to 0.4520 for A-B

REPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
2	0.0 - 100.0	0.18	1.1
8	100 - 500	6.2	1.9
20	500 - 1000	10.3	1.4
4	1000 - 1500	11.6	1.0
15	1500 - 3000	24.4	1.1
49	Overall	15.6	N/A

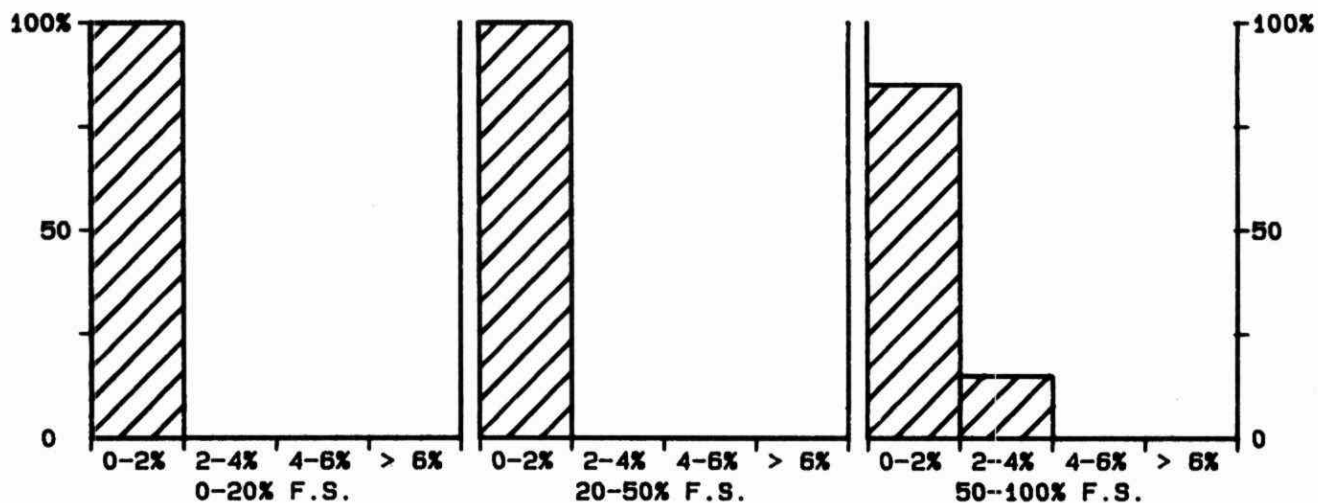
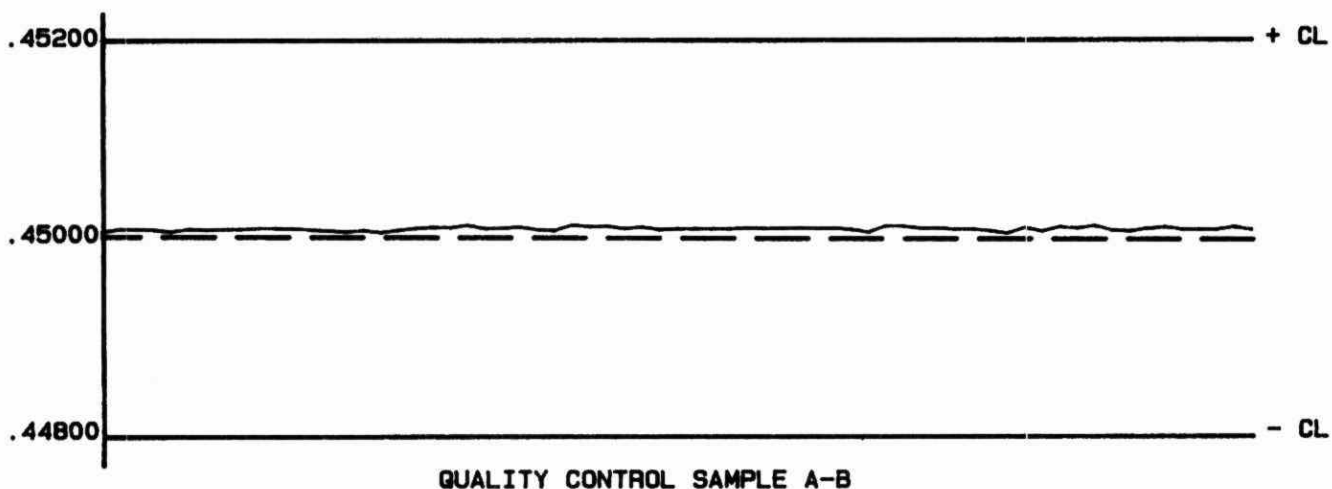
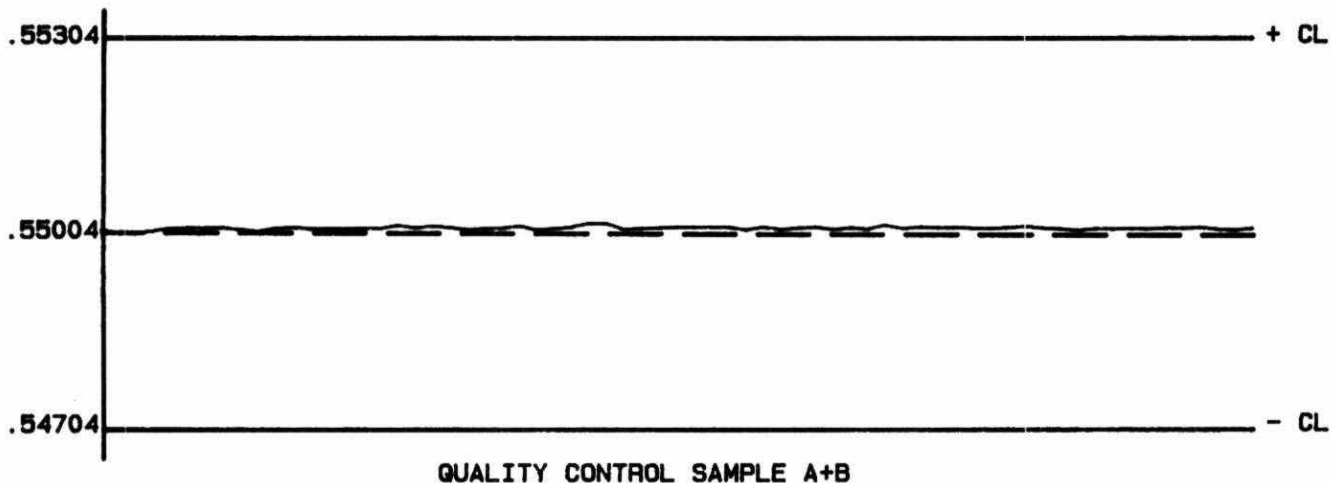
DETECTION CRITERION: 0.5

OTHER CHECKS:

	Number of Data	Data Mean	Standard(1) Deviation
Blank :	51	-0.61	0.497

QUALITY CONTROL GRAPHS SOLIDS - PARTICULATE IGNITED (MG/L)

FROM: 07/01/85
TO: 23/12/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 3000 MG/L

SOLIDS - TOTAL IGNITED
QUALITY CONTROL DATA FROM 07/01/85 TO 26/11/85

Lab: Sewage and Industrial Waste

Analytical Range: - to 30000 mg/L

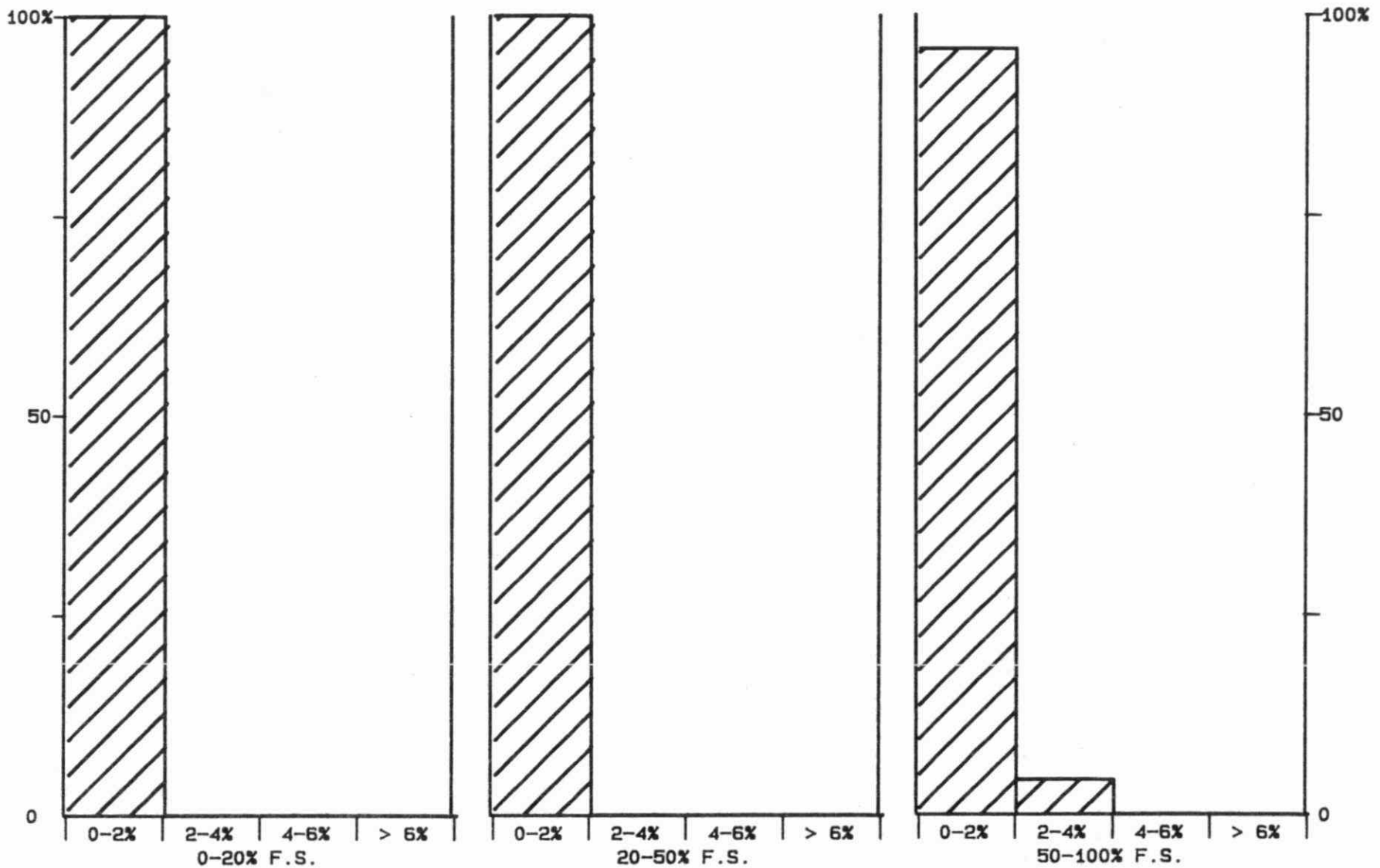
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	-----	-----	-----	-----
	16	0 - 4000	17.2	0.8
	5	4000 - 8000	57.6	0.9
	9	8000 - 12000	90.9	0.9
	7	12000 - 18000	115.6	0.7
	15	18000 - 30000	129.5	0.5
	52	Overall	92.1	N/A

DETECTION CRITERION: 52

OTHER CHECKS:		Number of Data	Data Mean	Standard(1) Deviation
		-----	-----	-----
Blank	:	47	0.62	6.887

QUALITY CONTROL GRAPH SOLIDS - TOTAL IGNITED (MG/L)

FROM: 07/01/85
TO: 26/11/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 30000 MG/L

*** SOLIDS - PARTICULATE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	RSP	Units	: mg/L
Work Station Code	: RMTSD	Unit Code	: 064000
Method Code	: 202A16	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Effluents		

SAMPLING:

Quantity Required: 150-500 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

An appropriate shaken sample volume (100 to 500 mL) is quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a prewashed and preweighed Whatman 934AH glass fibre filter. The cylinder and then the filter are washed with 25 mL distilled water; the rinse step is repeated. The filter is dried at 103 to 105 C, and stored in a desiccator until cool. After reweighing, the particulate residue or suspended solids content is calculated by difference. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance(6-decimal places), drying oven, suction filtration apparatus
-Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 1.4

CALIBRATION:

Balance zero and 1 built-in calibration weight

CONTROLS:

Calibration : 2 S class weights, eg, QCA
Recovery : LTBL plus 2 standards, eg, R1
Drift : Balance zero is checked frequently
Blank : Filter washed with 50 mL distilled water, result uncorrected.

MODIFICATIONS:

01/03/84 -QC program was expanded to include recovery standards.
01/05/84 -Microcomputer control was introduced.

SOLIDS - PARTICULATE
QUALITY CONTROL DATA FROM 02/01/85 TO 31/12/85

Lab: Rivers and Lakes

Analytical Range: 1.4 to 1000 mg/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	174	100.00	99.97	-0.03	0.047
b :	174	20.00	19.90	-0.10	0.019
a+b :	174	120.00	119.87	-0.13	0.066
a-b :	174	80.00	80.07	0.07	0.030

s.d.(AB): Sw(within run): 0.021 S(between runs): 0.036 S/Sw: 1.69

On any given day the calibration is accepted if the values obtained lie within the ranges:

119.81 to 120.19 for A+B
 79.88 to 80.12 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	137	50.00	48.87	2.999
r2 :	135	10.00	9.70	1.442

DUPLICATES:

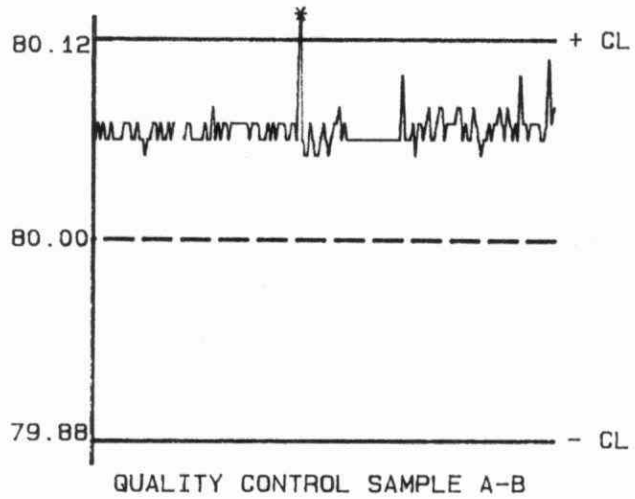
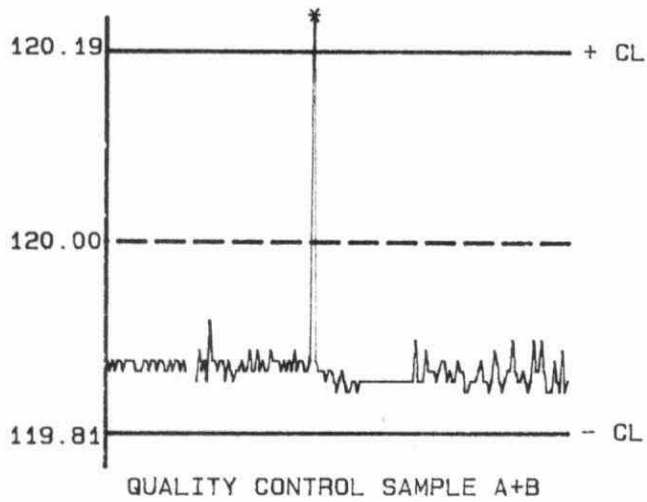
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
96	0.0 - 5.0	0.46	17.0
57	5.0 - 10.0	0.85	11.5
55	10.0 - 25.0	1.35	8.6
63	25.0 - 100.0	3.06	7.0
12	100 - 1000	6.6	2.0
283	Overall	2.1	N/A

DETECTION CRITERION: 1.4**OTHER CHECKS:**

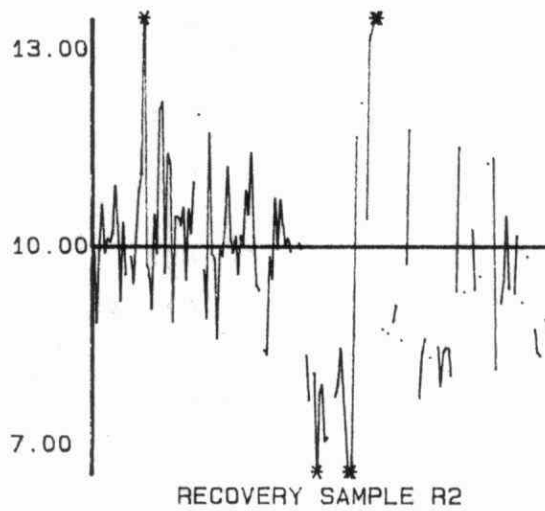
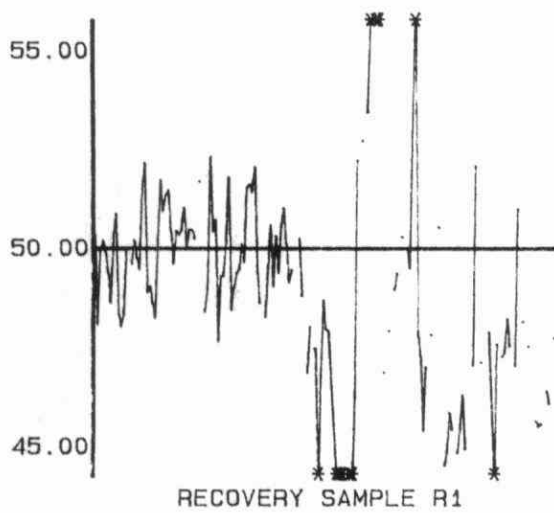
	Number of Data	Data Mean	Standard(1) Deviation
Blank :	63	-0.54	0.445

QUALITY CONTROL GRAPHS SOLIDS - PARTICULATE (MG/L)

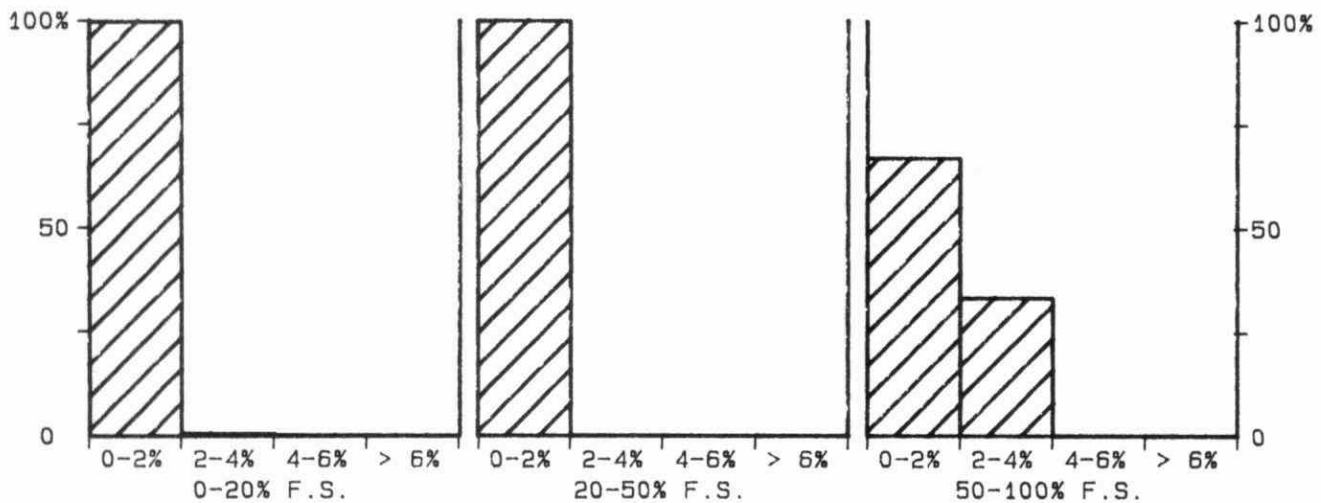
FROM: 02/01/85
TO: 31/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)



* DATA > 15% OUTSIDE CL



*** SOLIDS - PARTICULATE ***

IDENTIFICATION:

Laboratory	: Sewage/Industrial	Method Introduced:	Before '61
LIS Test Name Code:	RSP	Units	: mg/L
Work Station Code	: SOLIDS	Unit Code	: 064
Method Code	: 201A15	Supervisor	: P. Campbell
Sample Type/Matrix: Sewage, Industrial Waste, Drinking Waters, Leachate, Effluents			

SAMPLING:

Quantity Required: 75-500 mL
 Container : Glass or plastic

ANALYTICAL PROCEDURE:

An appropriate sample volume (25 to 500 mL) is quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The cylinder and then the filter are washed with 50 mL distilled water. The filter is dried at 103 to 105 C, and stored in a desiccator until cool. After reweighing, the particulate residue or suspended solids content is calculated by difference. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance (5-decimal places), drying oven, suction filtration apparatus
 -Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
 Minimum Increment (W) : 0.1 Detection Criterion (T): 2.5

CALIBRATION:

Balance zero

CONTROLS:

Calibration : 2 S class weights, eg, QCA for each balance (results in grams)
 Recovery : LTBL plus 2 standards, eg, R1
 Drift : Balance zero is checked at least 4 times daily
 Blank : Filter rinsed with 50 mL distilled water and corrected using blank correction factor outlined below (expected result is 0.00 mg/L).

MODIFICATIONS:

01/07/81- Current microcomputer control system was introduced.
 01/03/83- QC program was expanded to include recovery standards.
 01/05/83 - Prerinsing of filters was discontinued. Instead, 5 filters from each box of 100 are weighed before and after rinsing to correct results for filters used with samples.
 01/07/83 - New glass and acrylic filter holders (Whatman 90 mm) replaced Buchner funnels. Size and position of pores in the two types of holders is similar, but the filtration area is smaller and the seal at the filter edge is superior with the new holder.

SOLIDS - PARTICULATE
QUALITY CONTROL DATA FROM 02/01/85 TO 24/12/85

ab: Sewage and Industrial Waste

Analytical Range: 2.5 to 3000 mg/L

ALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	90	0.50002	0.50002	-0.00000	0.000026
b :	90	0.05002	0.05002	-0.00000	0.000025
a+b :	90	0.55004	0.55004	-0.00000	0.000046
a-b :	90	0.45000	0.45000	0.00000	0.000022

.d.(AB): Sw(within run):0.000016 S(between runs):0.000026 S/Sw: 1.64

n any given day the calibration is accepted if the values obtained lie within
 he ranges:

0.5470 to 0.5530 for A+B

0.4479 to 0.4520 for A-B

ECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	74	187	182	2.1
r2 :	67	47.2	47.2	1.28

UPLICATES:

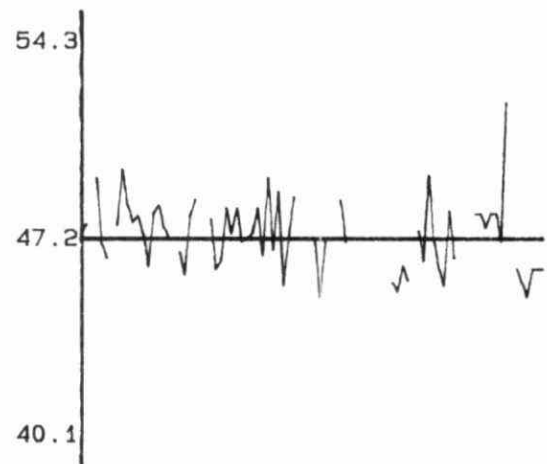
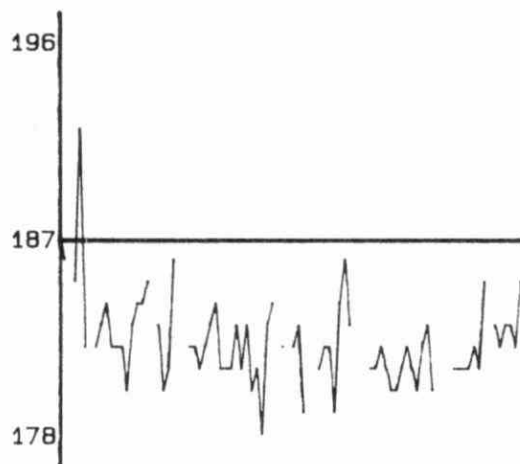
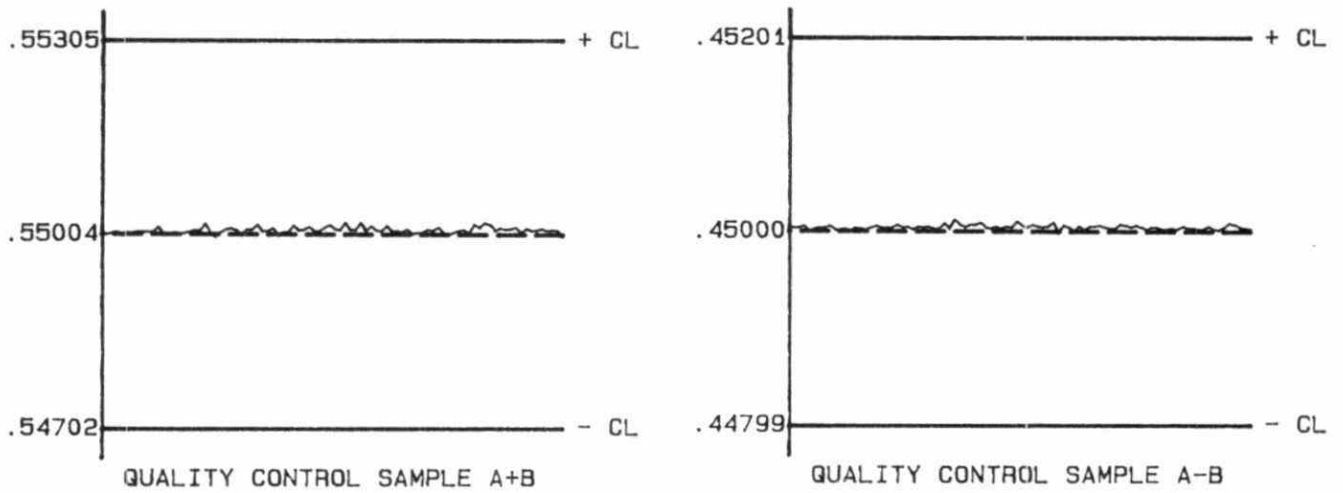
	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
15		0.0 - 25.0	0.83	6.8
24		25.0 - 50.0	2.92	7.4
78		50.0 - 150.0	2.29	2.4
46		150 - 3000	18.0	2.2
163		Overall	9.8	N/A

ETECTION CRITERION: 2.5**OTHER CHECKS:**

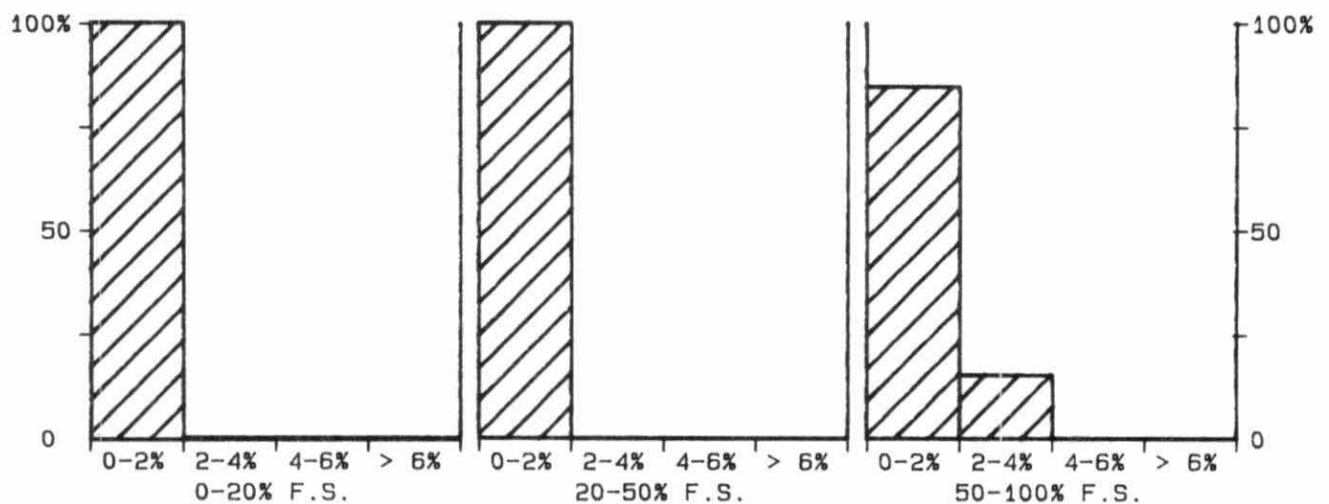
	Number of Data	Data Mean	Standard(1) Deviation
Blank :	83	0.06	0.357

QUALITY CONTROL GRAPHS SOLIDS - PARTICULATE (MG/L)

FROM: 02/01/85
TO: 24/12/85



* DATA > 15% OUTSIDE CL



*** SOLIDS- TOTAL ***

IDENTIFICATION:

Laboratory	: Sewage/Industrial	Method Introduced:	Before '61
LIS Test Name Code:	RST	Units	: mg/L or mg/Kg
Work Station Code	: SOLIDS	Unit Code	: 064000
Method Code	: 001A15	Supervisor	: P. Campbell
Sample Type/Matrix:	Sewage, Industrial Waste, Leachate, Domestic Waters, Effluents, Sludge		

SAMPLING:

Quantity Required: 75 mL to 125 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

A 50.0 mL aliquot of sample is pipetted into a preweighed teflon dish, dried at 103 to 105 C, and stored in a desiccator until cool. After reweighing the total residue or solids content is calculated by difference. Data collection, calculations, and transfer of results to LIS are controlled by a microcomputer system.

INSTRUMENTATION:

-Balance(4/5-decimal places),drying oven, ceramic dishes
-Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.5 Detection Criterion (T): 13

CALIBRATION:

Balance zero and 1 built-in calibration weight

CONTROLS:

Calibration : 2 S class weights, eg, QCA (results in grams)
Recovery : BL plus 2 standards, eg, R1
Drift : Balance zero is checked at least 4 times daily

MODIFICATIONS:

15/01/82 Microcomputer control was introduced

SOLIDS - TOTAL
QUALITY CONTROL DATA FROM 07/01/85 TO 23/12/85

Lab: Sewage and Industrial Waste

Analytical Range: 13 to 60000 mg/L

CALIBRATION CONTROL:

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	70	50.0004	50.0004	0.0000	0.00011
b :	70	30.0001	30.0001	-0.0000	0.00009
a+b :	70	80.0005	80.0005	-0.0000	0.00018
a-b :	70	20.0003	20.0004	0.0001	0.00010

s.d.(AB): Sw(within run): 0.00007 S(between runs): 0.00010 S/Sw: 1.42

On any given day the calibration is accepted if the values obtained lie within the ranges:

79.999 to 80.002 for A+B
 19.999 to 20.001 for A-B

RECOVERIES:

	Number of Data	Expected Concn	Av. Concn. Measured	Standard(1) Deviation
r1 :	33	20000	20016	58.5
r2 :	33	2000	2001	7.3

DUPLICATES:

	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
11		0 - 2000	4.4	0.8
8		2000 - 10000	50.8	0.8
10		10000 - 20000	80.2	0.6
12		20000 - 40000	368.5	1.2
10		40000 - 60000	345.6	0.7
51		Overall	238.8	N/A

DETECTION CRITERION: 13

OTHER CHECKS:

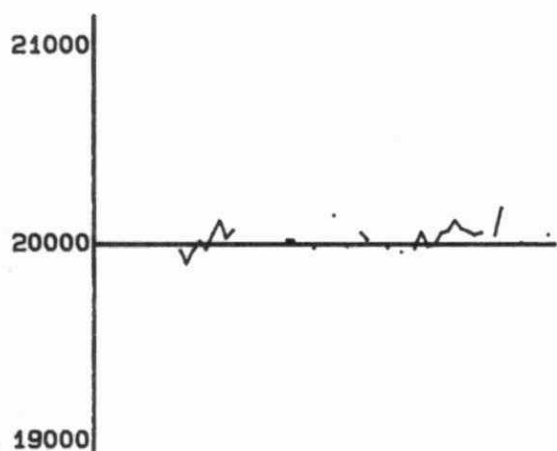
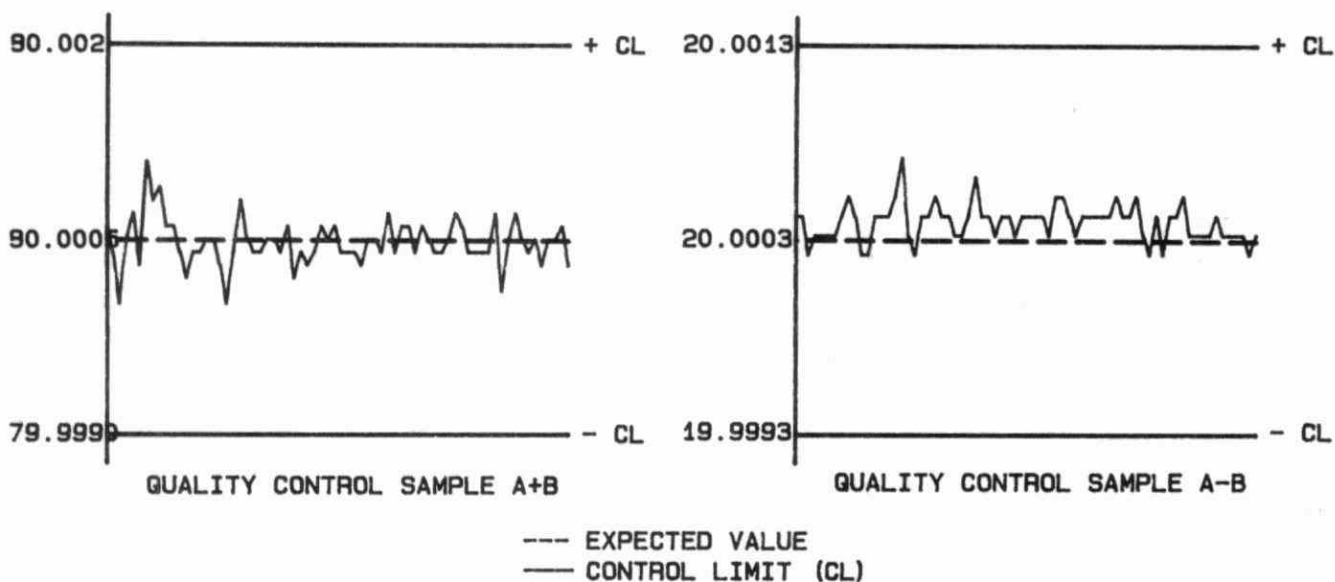
	Number of Data	Data Mean	Standard(1) Deviation
Blank :	34	0.28	3.965

QUALITY CONTROL GRAPHS

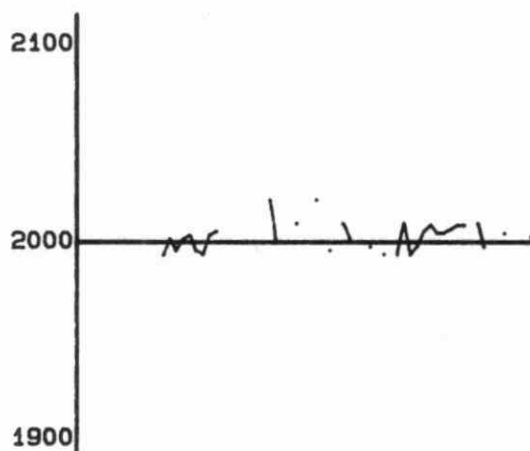
SOLIDS - TOTAL (MG/L)

FROM: 07/01/85

TO: 23/12/85

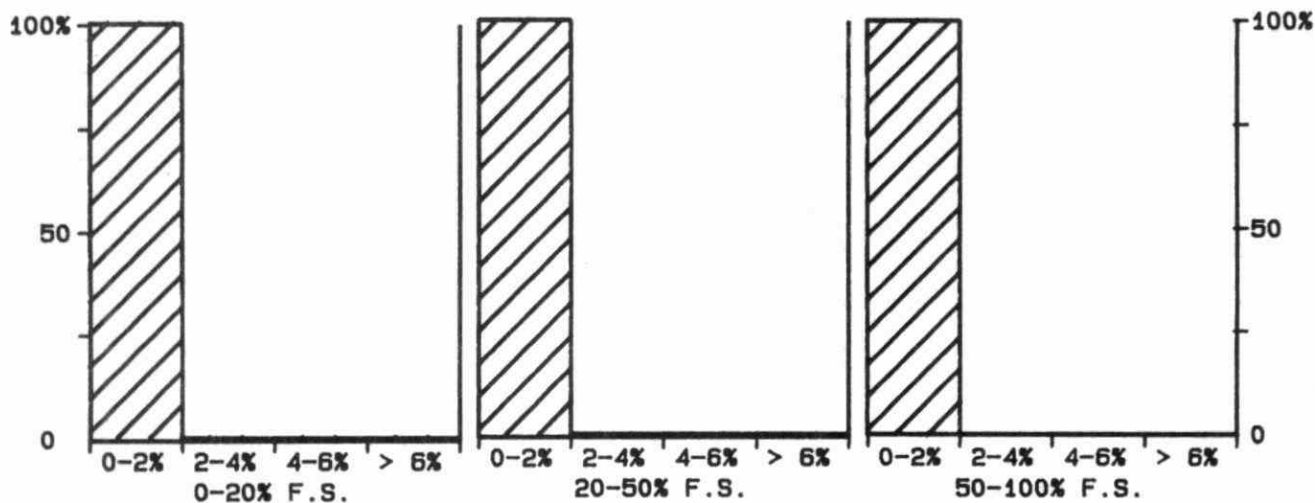


RECOVERY SAMPLE R1



RECOVERY SAMPLE R2

* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 60000 MG/L

*** SULPHATE ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method Introduced:	Before '75
LIS Test Name Code:	SS04UR	Units	: mg/L as SO ₄
Work Station Code	: WS04	Unit Code	: 064941
Method Code	: 003AC1	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Waters, Leachates, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Sample is pumped through an ion exchange column to suppress cationic interferences, and then the sulphate reacts with barium methyl-thymol blue to produce barium sulphate and methyl-thymol blue (MTB). The absorbance of MTB provides a measurement of the sulphate concentration.
Approximate absorbance: 1.0 at the 100 mg/L level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the modules: 37 C heating bath (7.7 mL delay), cationic exchange column. Colourimetric measurement is through a 5.0 cm light path at 460 nm.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.5	Detection Criterion (T): 1.1

CALIBRATION:

BL plus 1 standard in duplicate

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : BL plus 2 standards
Interference: BL spiked with 50 mg/L magnesium SO₄ and 200 mg/L calcium confirms efficiency of cation removal.

MODIFICATIONS:

01/10/81- A carbon dioxide trap was installed on the sodium hydroxide reagent.
01/10/84- A heating bath module (37 C) was installed preceding the colourimeter.

SULPHATE
QUALITY CONTROL DATA FROM 04/01/85 TO 30/12/85

Lab: Domestic Water

Analytical Range: 1.1 to 100.0 mg/L as SO₄**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	89	58.0	58.2	0.2	1.32
b :	89	11.6	11.9	0.3	0.55
a+b :	89	69.6	70.1	0.5	1.73
a-b :	89	46.4	46.2	-0.2	1.04

s.d.(AB): Sm(within run): 0.74 S(between runs): 1.01 S/Sm: 1.37

On any given day the calibration is accepted if the values obtained lie within the ranges:

65.1 to 74.1 for A+B
 43.4 to 49.4 for A-B

DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
29	0.0 - 10.0	0.38	6.5
66	10.0 - 20.0	0.55	3.6
90	20.0 - 50.0	0.54	1.6
39	50.0 - 100.0	0.81	1.2
224	Overall	0.58	N/A

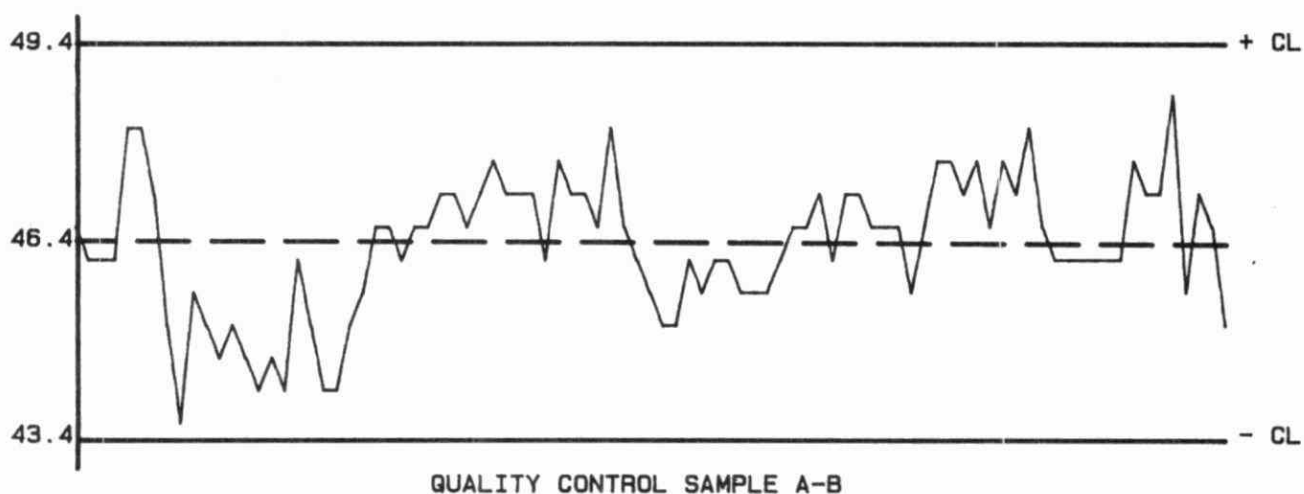
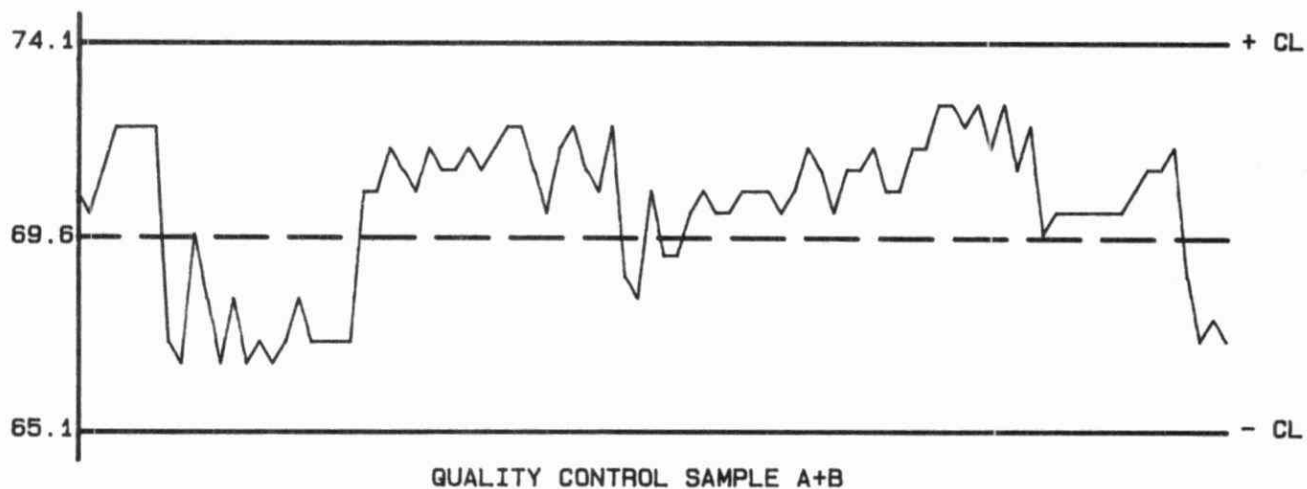
DETECTION CRITERION: 1.1

OTHER CHECKS:

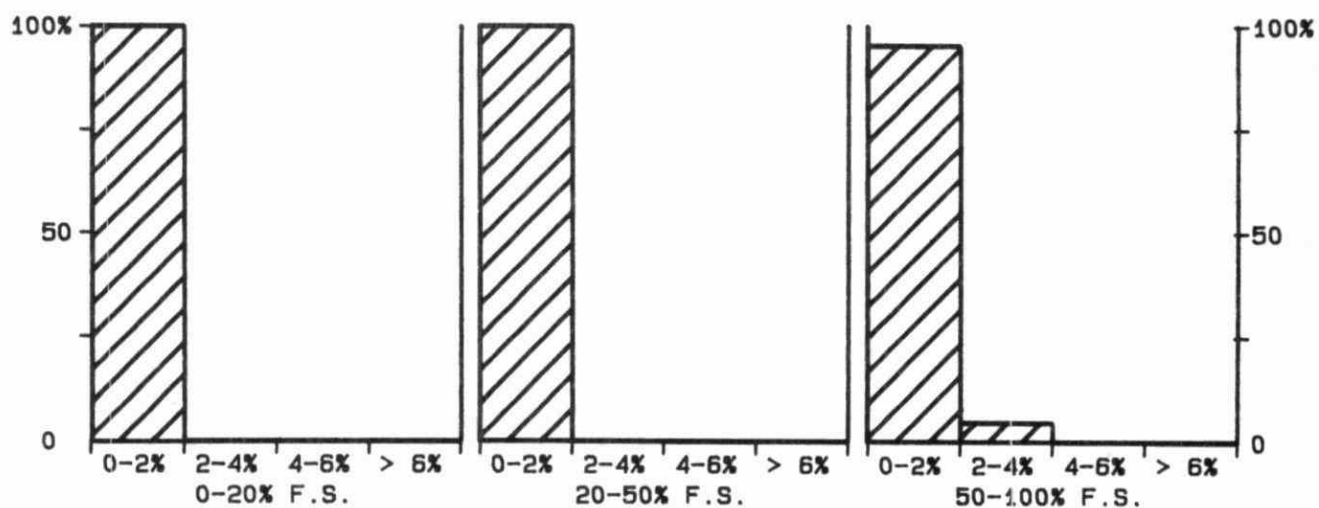
	Number of Data	Data Mean	Standard(1) Deviation
50mgSO ₄ +200mgCa/L :	89	50.1	0.57

QUALITY CONTROL GRAPHS SULPHATE (MG/L AS SO₄)

FROM: 04/01/85
TO: 30/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 MG/L AS SO₄

*** SULPHATE - PRECIPITATION ***

IDENTIFICATION:

Laboratory	: Precipitation	Method Introduced:	01/04/78
LIS Test Name Code:	SS04UR	Units	: mg/L as SO4
Work Station Code	: PRIC1	Unit Code	: 064941
Method Code	: 003AI0	Supervisor	: M. Rawlings
Sample Type/Matrix:	Precipitation, Throughfall, Stemflow.		

SAMPLING:

Quantity Required: 15 mL
Container : Polystyrene

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na2CO3/NaHCO3 to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO4 is determined by comparison of the sample scan to a series of standard scans.
Full scale conductivity : 10 uS/cm.
Nitrate and chloride are determined simultaneously.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus microcomputer for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures: 3	
Minimum Increment (W) : 0.05	Detection Criterion (T): 0.03

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples

SULPHATE
QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Precipitation

Analytical Range: 0.09 to 10.00 mg/L as SO₄**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	143	8.00	8.01	0.01	0.058
b :	142	2.00	2.00	0.00	0.033
a+b :	142	10.00	10.01	0.01	0.069
a-b :	142	6.00	6.01	0.01	0.065

s.d.(AB): Sw(within run): 0.046 S(between runs): 0.047 S/Sw: 1.03

On any given day the calibration is accepted if the values obtained lie within the ranges:

9.55 to 10.45 for A+B
 5.70 to 6.30 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	25	0.00 - 1.00	0.032	4.7
	40	1.00 - 2.00	0.040	2.5
	68	2.00 - 5.00	0.108	3.1
	47	5.00 - 10.00	0.259	3.7
	180	Overall	0.150	N/A

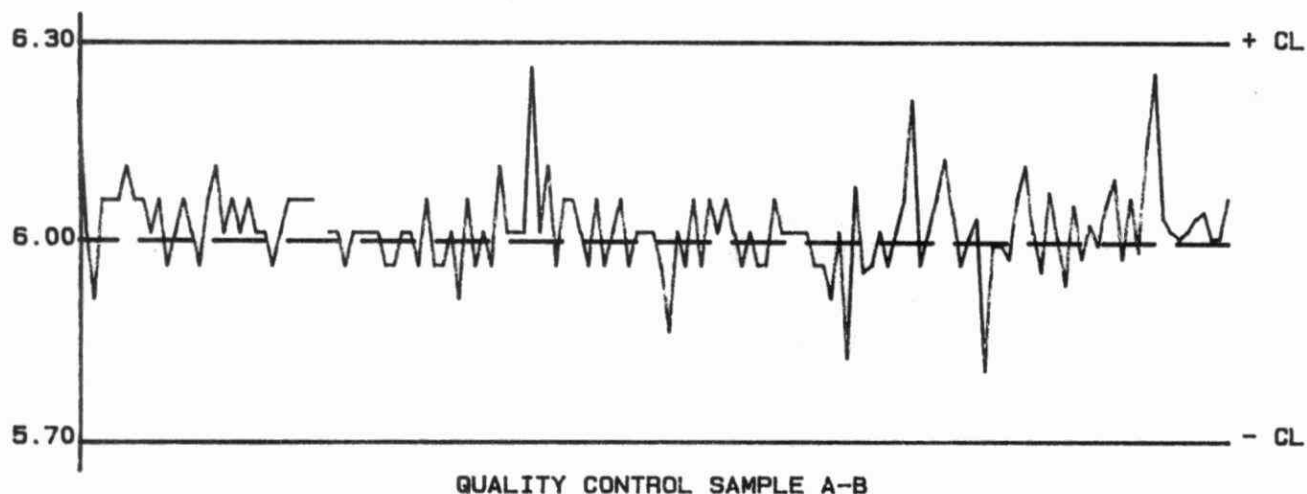
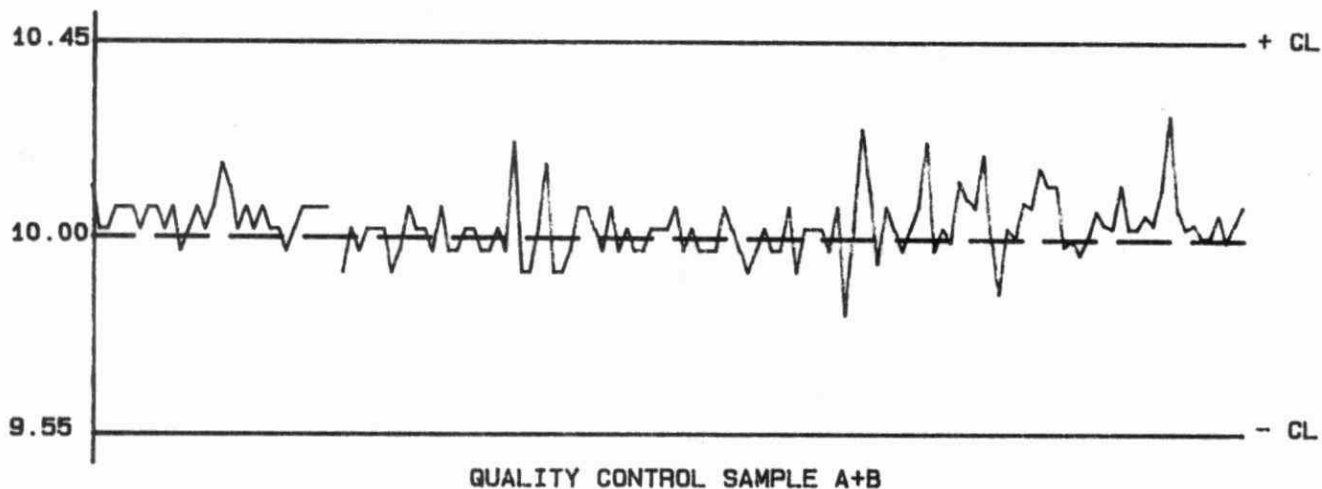
DETECTION CRITERION: 0.09

QUALITY CONTROL GRAPHS

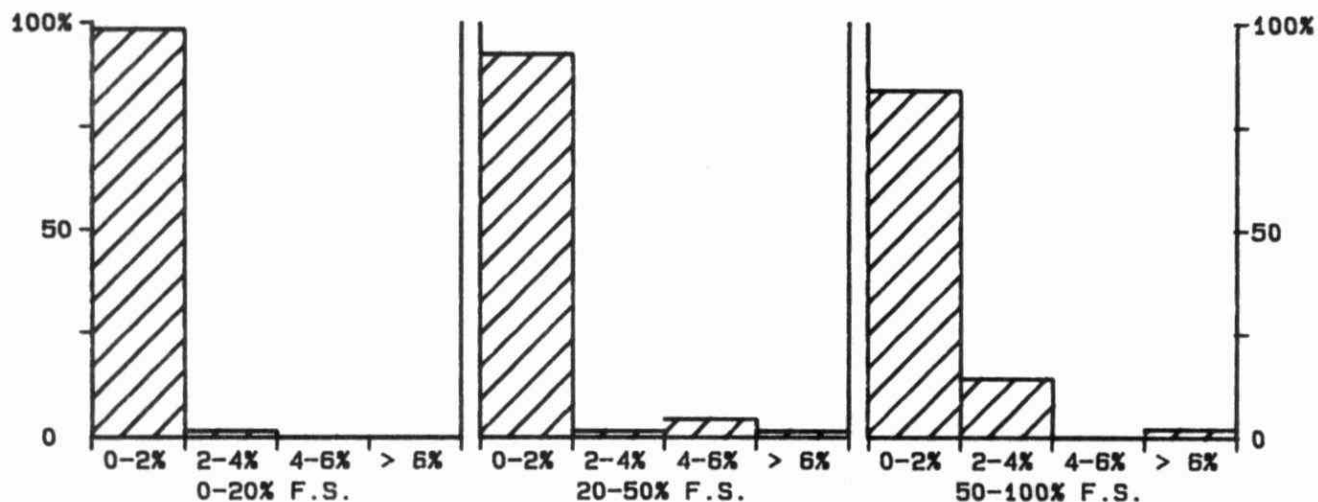
SULPHATE (MG/L AS SO₄)

FROM: 02/01/85

TO: 23/12/85



--- EXPECTED VALUE
 — CONTROL LIMIT (CL)
 * DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
 FULL SCALE VALUE (F.S.): 10 MG/L AS SO₄

*** SULPHATE ***

IDENTIFICATION:

Laboratory : Precipitation Method Introduced: 01/07/80
LIS Test Name Code: SS04FR SS04NF Units : ug/Filter as SO4
Work Station Code : PRSEQ Unit Code : 361941
Method Code : 004A10 Supervisor : M. Rawlings
Sample Type/Matrix: Teflon and nylon filters from sequential filter packs and
nylon filters from LoVol filter packs.

SAMPLING:

Quantity Required: 1 filter
Container : Polyethylene bag

SAMPLE PREPARATION:

Filters are extracted with 25 ml. of DDW (teflon) or 25 ml. of .03N NaOH
(nylon) in polystyrene tubes with ultrasonic treatment followed by a 24 hour
rest period.

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample extract by automated
suppressed ion chromatography using an eluent mixture of 0.003M sodium
bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples
are spiked with Na2CO3/NaHCO3 to match the eluent strength and maintain
background conductivity. The concentration of sulphate in mg/L as SO4 is
determined by comparison of the sample scan to a series of standard scans.
Results are converted to ug/filter as SO4.
Full scale conductivity : 30 uS/cm.
Nitrate and chloride are determined simultaneously.

INSTRUMENTATION:

-Ultrasonic bath; polystyrene tubes
-Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 1.25 Detection Criterion (T): 3

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples

MODIFICATIONS:

01/07/80 - Ion chromatographic procedure for precipitation samples was modified
for analysis of teflon and nylon filter extracts by developing the above filter
extraction procedure
10/03/84 - Microcomputer for automated sampling and timing was introduced. At
that time automated spiking of samples with Na2CO3/NaHCO3 was introduced.
10/05/85 - Microcomputer used for data reduction.
- Three additional calibration standards were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one
filter because duplicate filters are not received.

SULPHATE
QUALITY CONTROL DATA FROM 04/01/85 TO 27/12/85

Lab: Precipitation

Analytical Range: 3 to 250 ug/Filter as SO₄**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	160	200	201	1	1.6
b :	160	50	50	0	0.8
a+b :	160	250	250	0	1.9
a-b :	160	150	151	1	1.7

s.d.(AB): Sw(within run): 1.2 S(between runs): 1.3 S/Sw: 1.05

In any given day the calibration is accepted if the values obtained lie within the ranges:

235 to 265 for A+B
 140 to 160 for A-B

DUPLICATES:

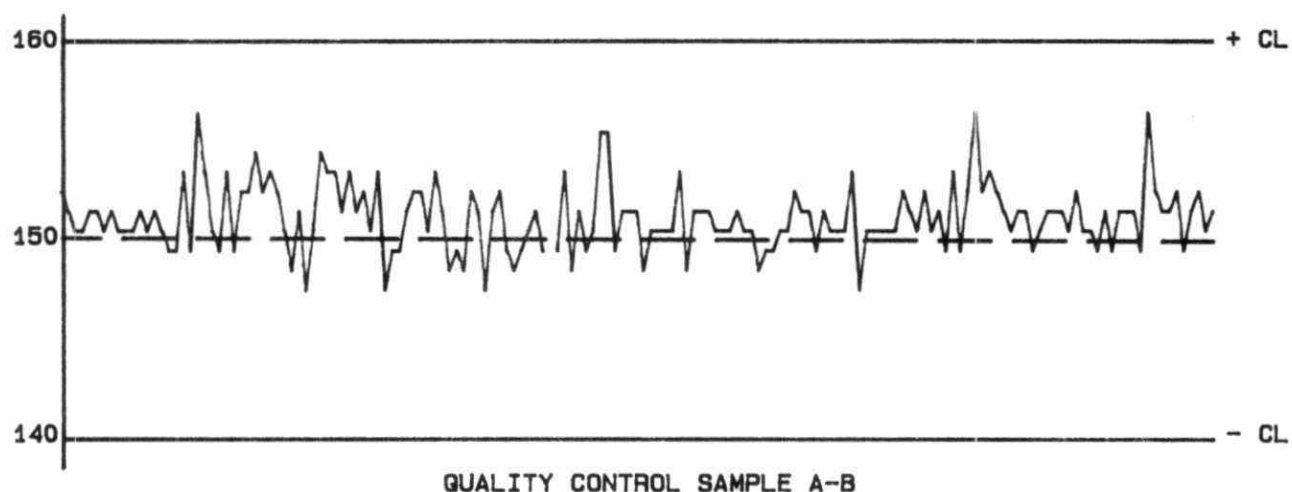
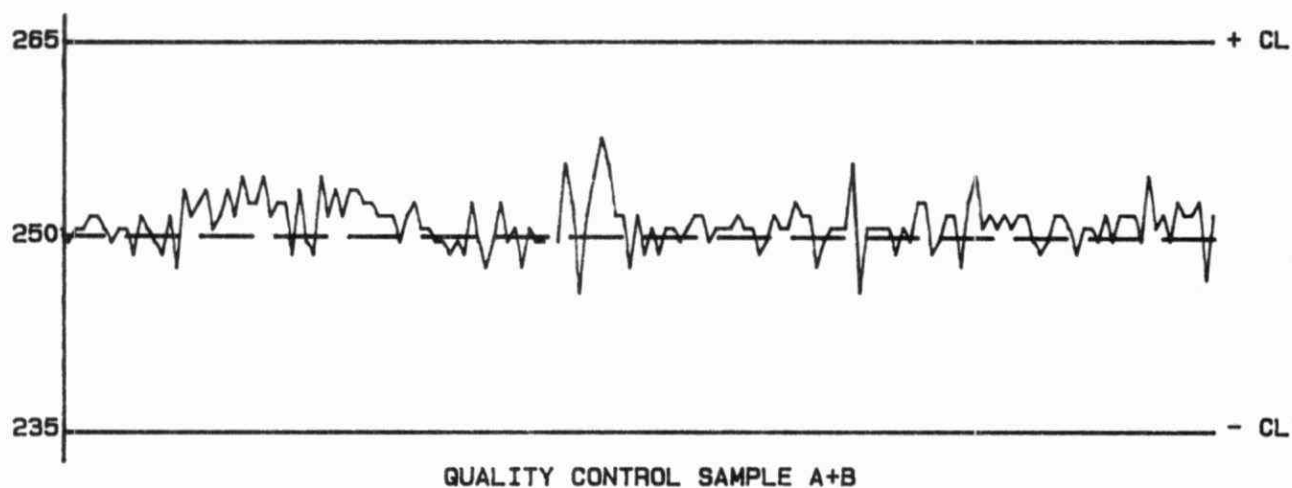
Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
208	0 - 25	1.1	11.1
46	25 - 50	2.0	5.4
47	50 - 125	2.6	3.4
23	125 - 250	4.9	2.8
324	Overall	2.0	N/A

DETECTION CRITERION: 3

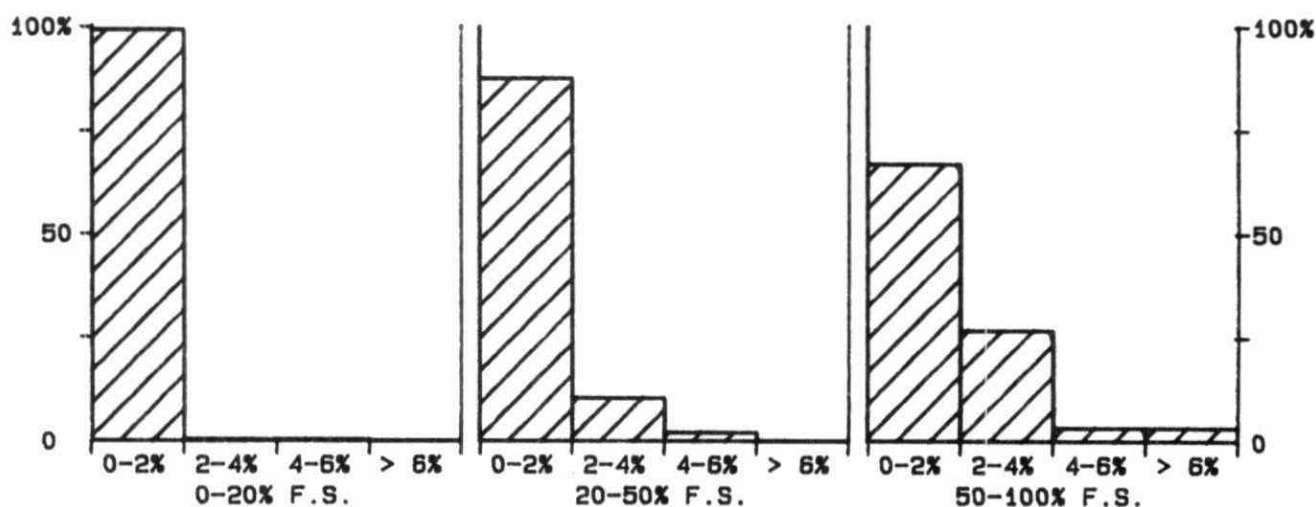
QUALITY CONTROL GRAPHS SULPHATE (UG/FILTER AS S04)

FROM: 04/01/85

TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 250 UG/FILTER AS S04

*** SULPHATE ***

IDENTIFICATION:

Laboratory : Precipitation Method Introduced: 01/07/80
LIS Test Name Code: SS04UR Units : ug/Filter as SO4
Work Station Code : PRL0V Unit Code : 361941
Method Code : 004AIC Supervisor : M. Rawlings
Sample Type/Matrix: W40 filters from LoVol filter packs.

SAMPLING:

Quantity Required: 1 filter
Container : Polyethylene bags

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW in polyethylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample extract by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by comparison of the sample scan to a series of standard scans. Results are converted to ug/filter as SO₄.
Full scale conductivity : 30 uS/cm.
N.B. Nitrate and chloride are determined simultaneously.

INSTRUMENTATION:

-Ultrasonic bath; polyethylene tubes
-Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 2.50 Detection Criterion (T): 9

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples

MODIFICATIONS:

01/08/81 - Ion chromatographic procedure for precipitation samples was modified for analysis of LoVol W40 filter extracts by developing the above filter extraction procedure.
10/03/84 - Microcomputer for automated sampling and timing was introduced. At that time automated spiking of samples with Na₂CO₃/NaHCO₃ was introduced.
10/05/85 - Microcomputer used for data reduction.
10/05/85 - Three additional calibration standards were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received.
No data summary available for period not covered in performance report.

SULPHATE
QUALITY CONTROL DATA FROM 05/02/85 TO 10/12/85

Lab: Precipitation

Analytical Range: 9 to 500 ug/Filter as SO₄**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard (1) Deviation
a :	26	400	401	1	3.6
b :	26	100	99	-1	1.7
a+b :	26	500	500	0	3.4
a-b :	26	300	302	2	4.4

s.d.(AB): Sw(within run): 3.1 S(between runs): 2.8 S/Sw: 0.90

On any given day the calibration is accepted if the values obtained lie within the ranges:

470 to 530 for A+B
 280 to 320 for A-B

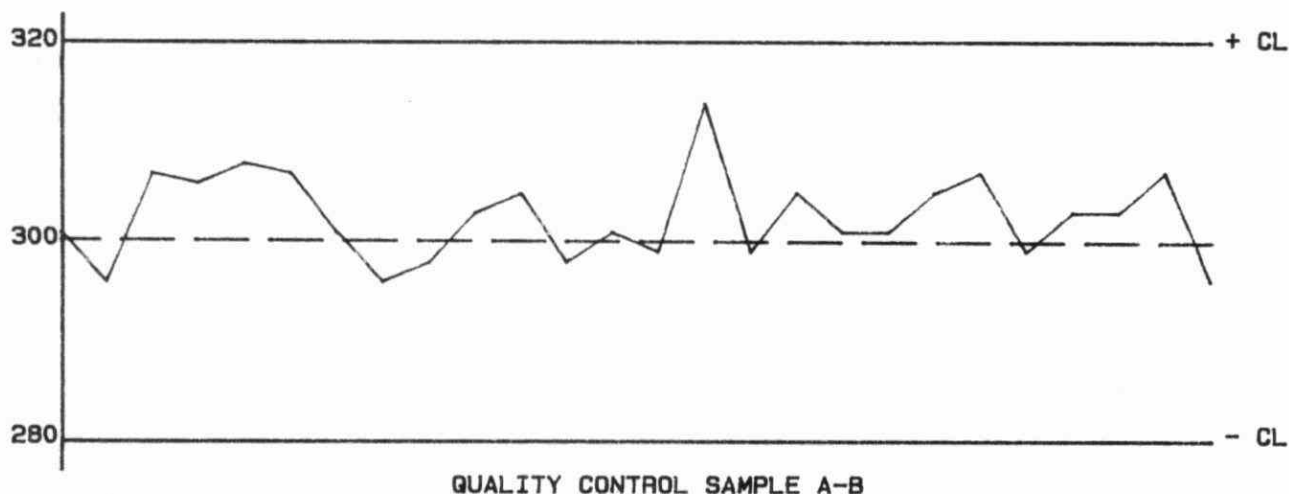
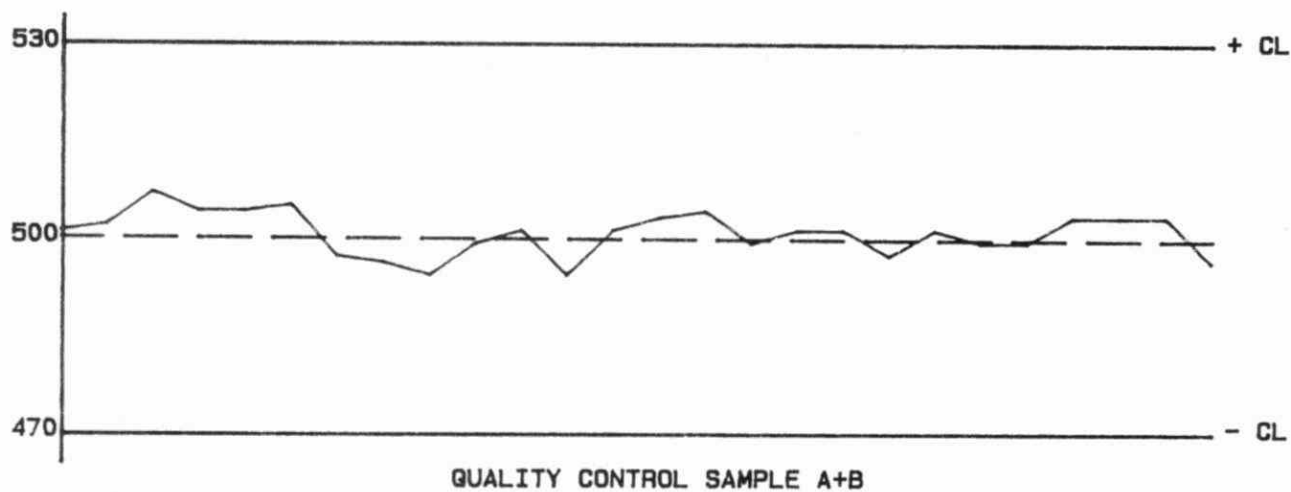
DUPLICATES:

Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
20	0 - 50	3.1	14.4
10	50 - 100	3.8	4.6
6	100 - 250	2.8	1.9
7	250 - 500	2.9	0.9
43	Overall	3.2	N/A

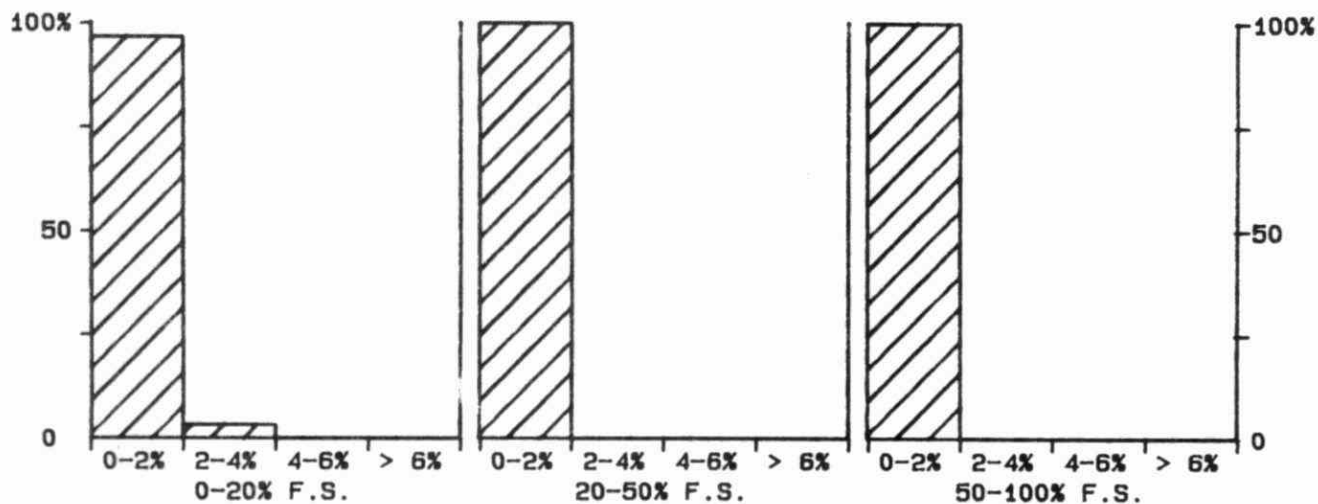
DETECTION CRITERION: 9

QUALITY CONTROL GRAPHS SULPHATE (UG/FILTER AS S04)

FROM: 05/02/85
TO: 10/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 500 UG/FILTER AS S04

*** SULPHATE ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/82
LIS Test Name Code:	SS04UR	Units	: mg/L as SO ₄
Work Station Code	: RMDSO4	Unit Code	: 064941
Method Code	: 003A10	Supervisor	: J. Crowther
Sample Type/Matrix:	Rivers, Lakes, Soil Extracts, Effluents		

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. The concentration of sulphate in mg/L as SO₄ is determined by comparison of the sample scan to a series of standard scans.

Full scale conductivity : 100 uS/cm.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus control module (in-house design) for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures:	3
Minimum Increment (W) :	0.05
Detection Criterion (T):	0.76

CALIBRATION:

BL plus 16 standards

CONTROLS:

Calibration : LTBL plus 3 standards, eg, QCA
Drift : 2 standards

MODIFICATIONS:

01/04/82- The sulphate procedure that was introduced differed slightly from Method B in HAMES: (1) full scale values for the analytical ranges were 20.0 and 50.0 mg/L, and (2) samples were not spiked with concentrated eluent. The latter was not necessary because only sulphate was measured and spiking is required for chloride analysis.

01/01/84- Packed suppressor column was replaced by a fibre suppressor (walls of fibre are ion-exchange media). Full scale for high analytical was increased from 50.0 to 100 mg/L as SO₄; QC standards were adjusted accordingly. Analytical rate was doubled.

17/10/85- Increase number of standards to 16 to ensure proper calibration at low end of analytical range.

SULPHATE
QUALITY CONTROL DATA FROM 02/01/85 TO 23/12/85

Lab: Rivers and Lakes

Analytical Range: 0.76 to 100.0 mg/L as SO₄**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard (1) Deviation
a :	110	60.0	60.0	-0.0	0.78
b :	110	15.0	15.2	0.2	0.39
a+b :	110	75.0	75.2	0.2	0.90
a-b :	110	45.0	44.8	-0.2	0.83
c :	111	15.00	15.04	0.04	0.203
d :	111	5.00	5.05	0.05	0.108
c+d :	111	20.00	20.09	0.09	0.225
c-d :	111	10.00	10.00	-0.00	0.236

s.d.(AB): Sw(within run): 0.59 S(between runs): 0.62 S/Sw: 1.05
s.d.(CD): Sw(within run): 0.167 S(between runs): 0.163 S/Sw: 0.97

In any given day the calibration is accepted if the values obtained lie within the ranges:

70.5 to 79.5 for A+B
42.0 to 48.0 for A-B
19.10 to 20.90 for C+D
9.40 to 10.60 for C-D

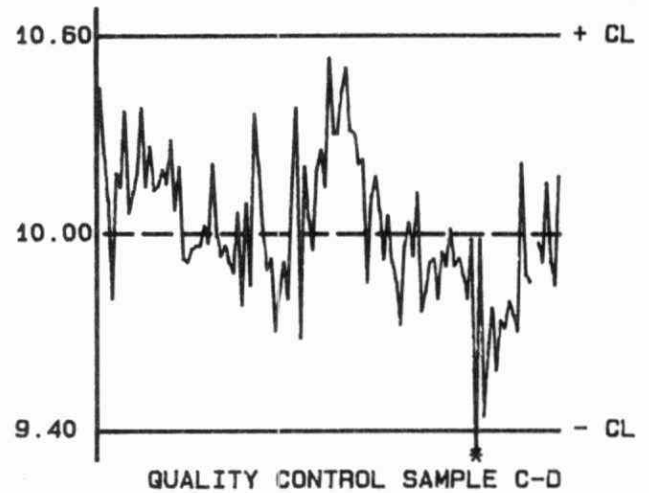
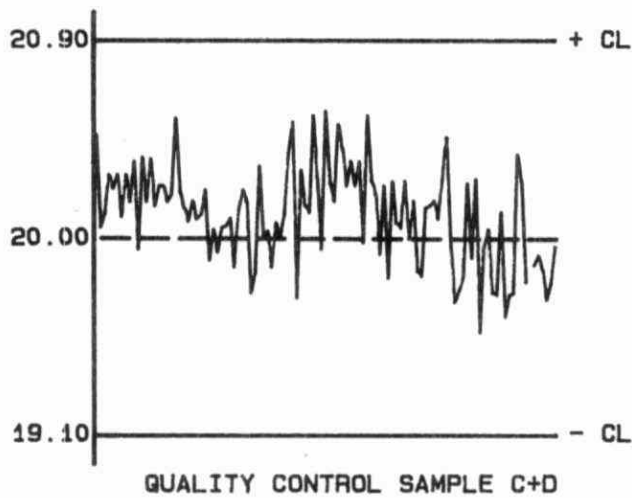
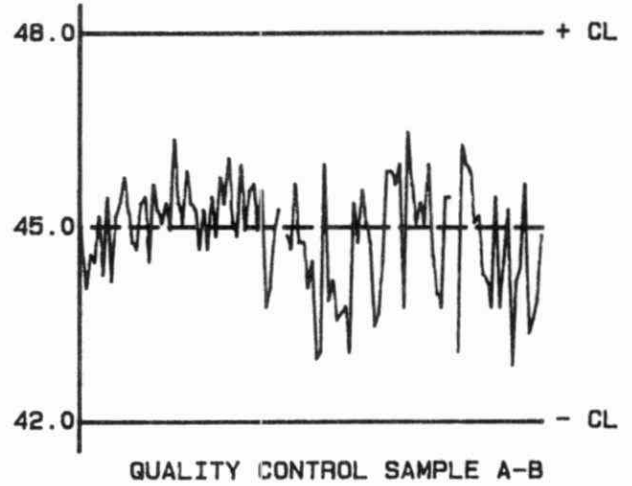
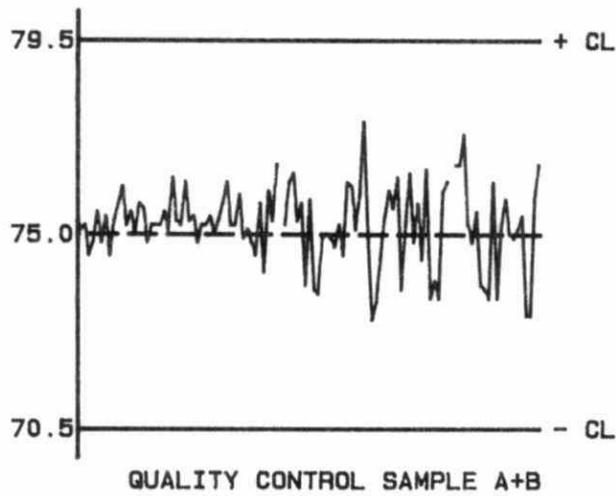
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	15	0.00 - 2.00	0.253	29.8
	38	2.00 - 5.00	0.178	4.8
	189	5.00 - 10.00	0.235	3.2
	72	10.0 - 20.0	0.52	3.9
	49	20.0 - 100.0	1.07	2.7
	363	Overall	0.49	N/A

DETECTION CRITERION: 0.76**OTHER CHECKS:**

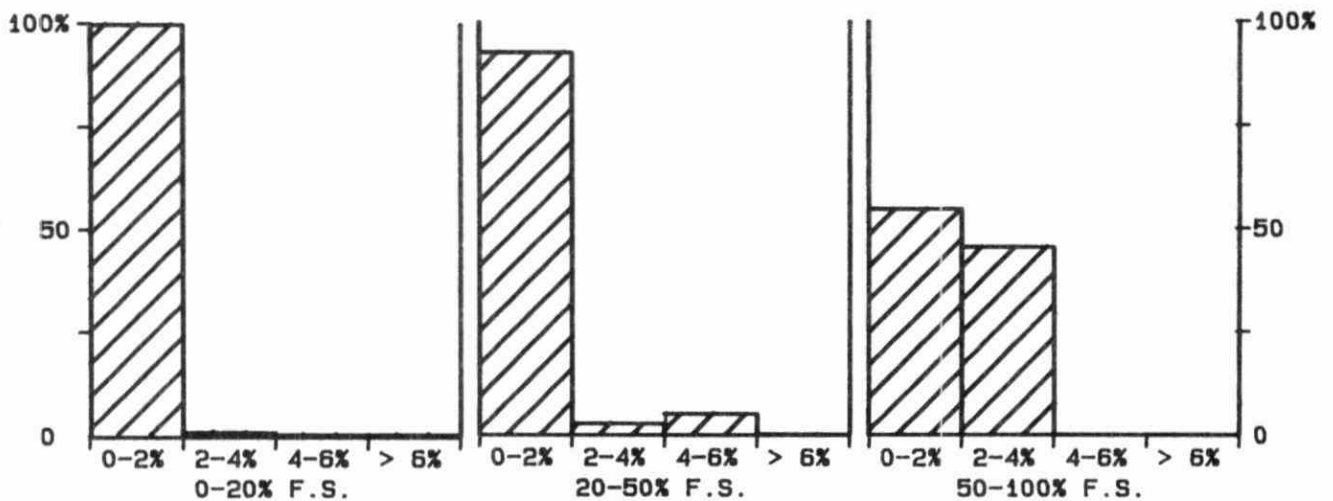
	Number of Data	Data Mean	Standard (1) Deviation
Long Term Blank :	112	0.00	0.020

QUALITY CONTROL GRAPHS SULPHATE (MG/L AS SO₄)

FROM: 02/01/85
TO: 23/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 100 MG/L AS SO₄

*** SULPHUR DIOXIDE ***

IDENTIFICATION:

Laboratory : Precipitation Method Introduced: 01/07/80
LIS Test Name Code: SS02FR Units : ug/Filter as SO2
Work Station Code : PRSEQ,PRLOV Unit Code : 361943
Method Code : 004A10 Supervisor : M. Rawlings
Sample Type/Matrix: Impregnated W41 filters from sequential and LoVol filter packs.

SAMPLING:

Quantity Required: 1 filter
Container : Polyethylene bags
Other : Filter is impregnated with potassium carbonate/glycerol solution.

SAMPLE PREPARATION:

Filters are extracted with 50 ml. of 0.05% H2O2 in polystyrene tubes with 1 hour of mechanical shaking, followed by ultrasonic treatment to enhance extraction, then a 24 hour rest period. SO2 is converted to SO4 in the process.

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample extract by automated suppressed ion chromatography using an eluent mixture of 0.003M sodium bicarbonate and 0.0024M sodium carbonate with conductivity detection. Samples are spiked with Na2CO3/NaHCO3 to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO4 is determined by comparison of the sample scan to a series of standard scans. Results are converted to ug/filter as SO2.
Full scale conductivity : 10 uS/cm.

INSTRUMENTATION:

-Mechanical shaker; ultrasonic bath; polyethylene tubes
-Automated modular continuous flow ion chromatographic system.

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 1.65 Detection Criterion (T): 3.9

CALIBRATION:

BL plus 3 standards

CONTROLS:

Calibration : 2 standards, eg, QCA
Drift : 1 standard every 10 samples

MODIFICATIONS:

01/07/80 - Ion chromatographic procedure for precipitation samples was modified for analysis of W41 filter extracts by developing the extraction procedure.
10/03/84 - Microcomputer for automated sampling and timing was introduced. At that time automated spiking of samples with Na2CO3/NaHCO3 was introduced.
15/03/84 - Streamlined procedure for extraction of W41 filters in one 50 mL polyethylene tube was adopted, eliminating two container transfers, and changing the extraction volume to 50.0 mL from 100.0 mL. Full scale reduced from 700 to 350ug/filter as SO2.
10/05/85 - Microcomputer used for data reduction.
- Three additional calibration samples were set up.

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received.

SULPHUR DIOXIDE
QUALITY CONTROL DATA FROM 04/01/85 TO 27/12/85

Lab: Precipitation

Analytical Range: 3.9 to 350 ug/Filter as SO₂**CALIBRATION CONTROL:**

	Number of Data	Expected Concn	Av. Concn Measured	Av. Bias	Standard(1) Deviation
a :	146	268	265	-3	3.5
b :	146	66	67	1	2.1
a+b :	146	334	333	-1	4.3
a-b :	146	202	198	-4	3.9

s.d.(AB): Sw(within run): 2.8 S(between runs): 2.9 S/Sw: 1.05

On any given day the calibration is accepted if the values obtained lie within the ranges:

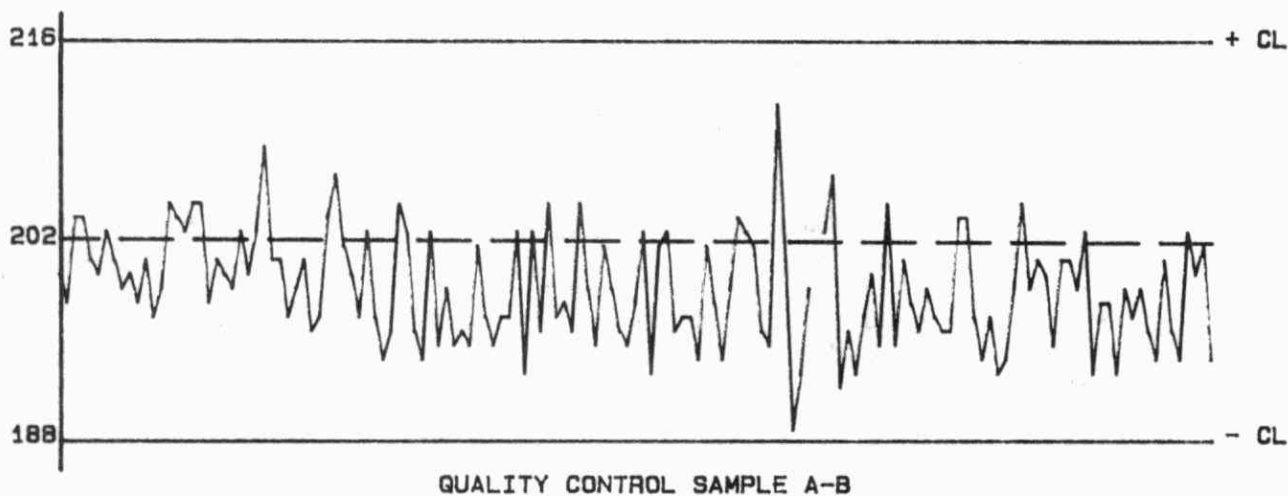
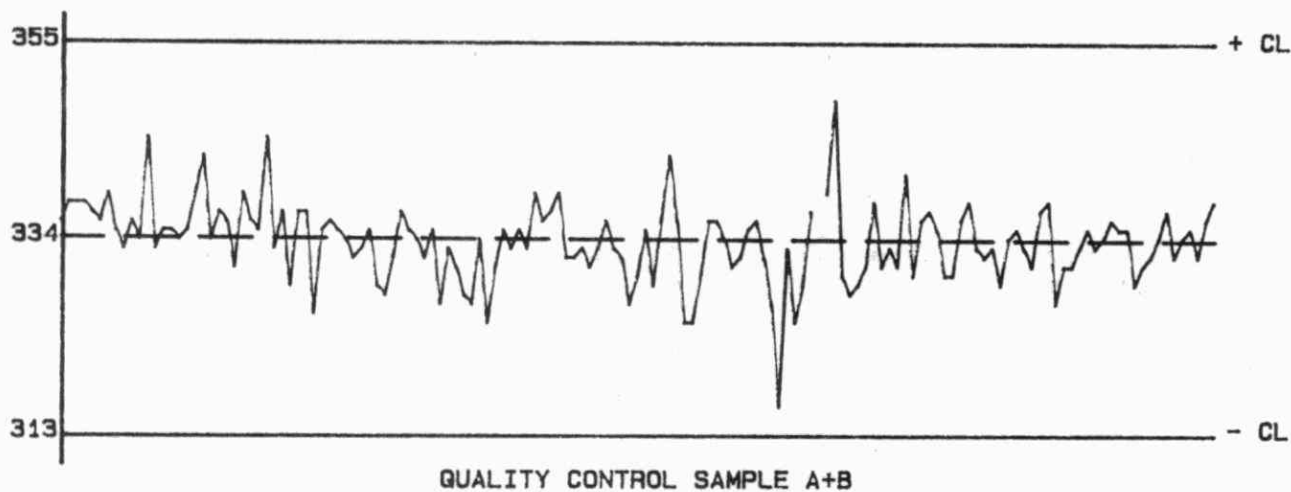
313 to 355 for A+B
 188 to 216 for A-B

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	179	0.0 - 35.0	1.28	15.0
	40	35.0 - 70.0	3.18	5.8
	45	70.0 - 175.0	5.01	4.1
	16	175 - 350	10.6	4.4
	280	Overall	3.6	N/A

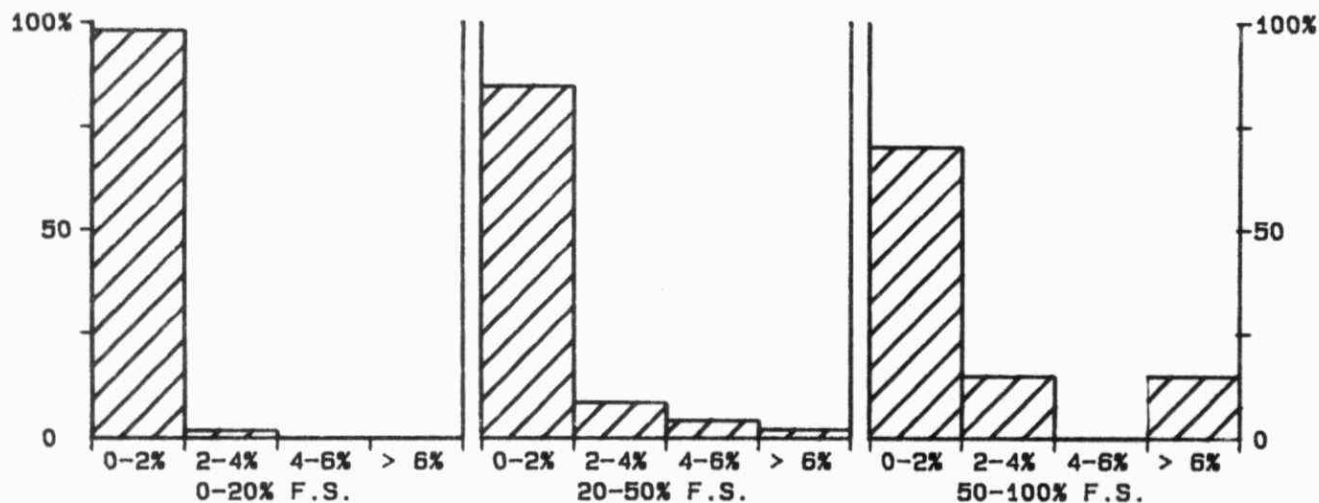
DETECTION CRITERION: 3.9

QUALITY CONTROL GRAPHS SULPHUR DIOXIDE (UG/FILTER AS SO₂)

FROM: 04/01/85
TO: 27/12/85



--- EXPECTED VALUE
— CONTROL LIMIT (CL)
* DATA > 15% OUTSIDE CL



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 350 UG/FILTER AS SO₂

*** TURBIDITY ***

IDENTIFICATION:

Laboratory	: Domestic Water	Method	: Before '74
LIS Test Name Code	: TURB	Units	: FTU
Work Station Code	: WTURB	Unit Code	: 343000
Method Code	: 002A11	Supervisor	: M. Rawlings
Sample Type/Matrix: Domestic Water, Leachates, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

The instrument is standardized periodically with freshly prepared formazin standards. Samples are placed in the turbidimeter, and results in FTU are read directly from the digital output. Turbidity measurement are based on light scattering at 90 plus or minus 30 degrees of rotation. The instrument compensates for sample colour.

INSTRUMENTATION:

Hach Ratio 18900 Turbidimeter

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.09

CALIBRATION:

BL plus formazin standards (at least once annually)

CONTROLS:

Calibration: BL plus two standards, eg, QCA *

MODIFICATIONS:

01/03/84-Hach 2100A turbidimeter was replaced by Hach ratio turbidimeter. In the past samples were not stirred during turbidity measurements in the Domestic Water laboratory even though the former instrument (Hach 2100A) possessed this capability. Thus the effect of changing the instrumentation was minimal.

01/09/85 Controls QCA,QCB introduced: These controls are aqueous suspensions of beads composed of a styrene-divinylbenzene polymer and are formulated to "match" the performance of formazin standards on the HACH 18900 turbidimeter.

*Insufficient data collected for inclusion in performance report.

TURBIDITY
QUALITY CONTROL DATA FROM 03/01/85 TO 30/12/85

Lab: Domestic Water

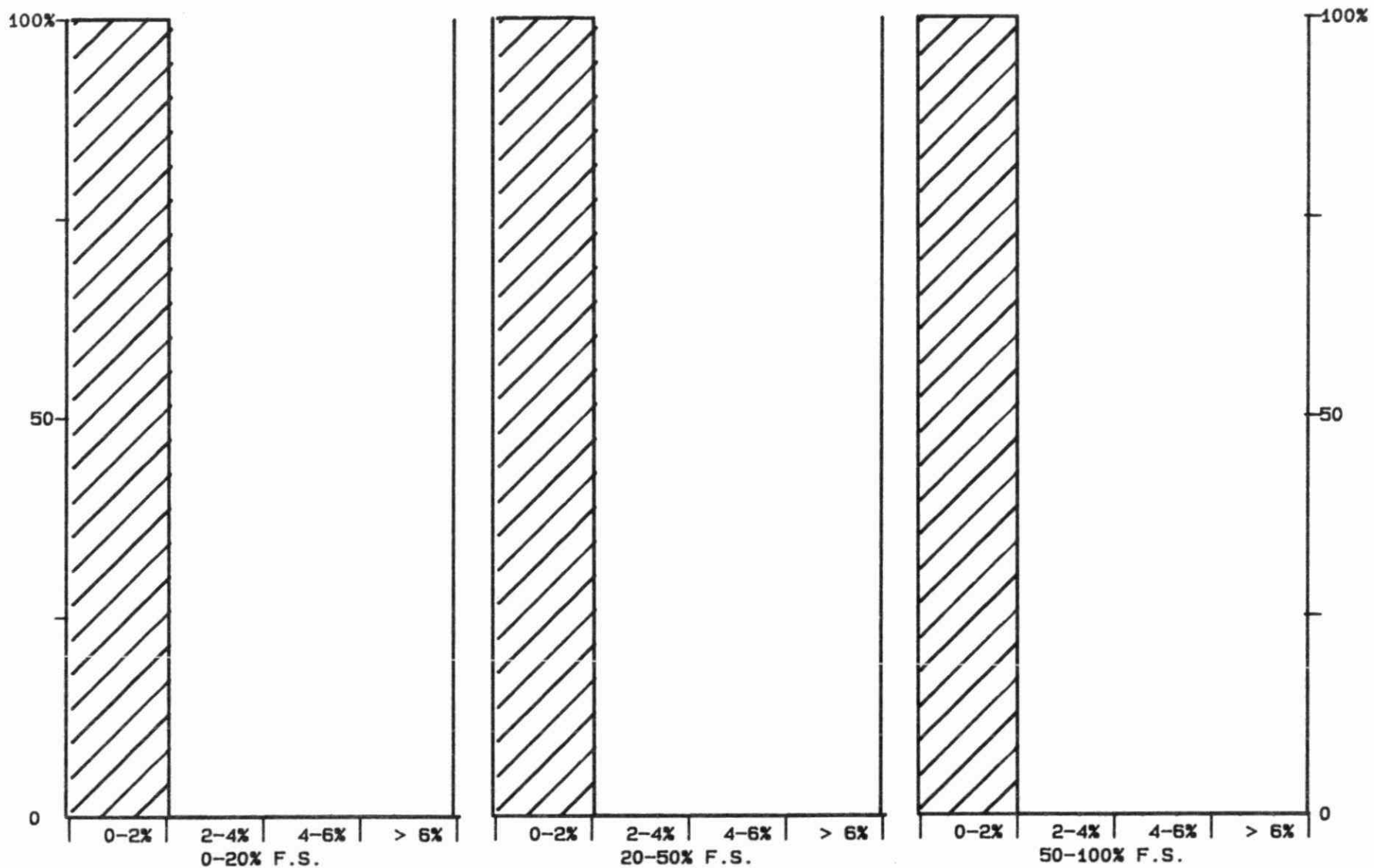
Analytical Range: 0.09 to 200 FTU

DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	-----	-----	-----	-----
	181	0.00 - 2.00	0.031	4.8
	88	2.0 - 20.0	0.39	5.8
	17	20 - 100	0.8	2.0
	6	100 - 200	0.8	0.5
	292	Overall	0.3	N/A

DETECTION CRITERION: 0.09

QUALITY CONTROL GRAPH TURBIDITY (FTU)

FROM: 03/01/85
TO: 30/12/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 200 FTU

*** TURBIDITY ***

IDENTIFICATION:

Laboratory	: Rivers and Lakes	Method Introduced:	01/04/74
LIS Test Name Code:	TURB	Units	: FTU
Work Station Code	: RMTURB	Unit Code	: 343000
Method Code	: 002A11	Supervisor	: J. Crowther
Sample Type/Matrix: Rivers, Lakes, Effluents			

SAMPLING:

Quantity Required: 50 mL
Container : Glass or plastic

ANALYTICAL PROCEDURE:

The instrument is standardized with a sealed standard which is prepared commercially from latex polymers of known size and rated in Formazin Turbidity Units. Samples are placed in the turbidimeter, and results in FTU are read directly from the digital output. Turbidity measurement are based on light scattering at 90 plus or minus 30 degrees of rotation. The instrument compensates for sample colour.

INSTRUMENTATION:

- Hach Ratio 18900 Turbidimeter

REPORTING:

Maximum Significant Figures: 3
Minimum Increment (W) : 0.01 Detection Criterion (T): 0.21

CALIBRATION:

BL plus formazin standards (at least once annually)

CONTROLS:

Calibration: B1 plus two standards, eg, QCA*

MODIFICATIONS:

01/04/82-Hach 2100A turbidimeter was replaced by Hach ratio turbidimeter. As of this date samples are no longer stirred during turbidity measurements, and thus the effect of heavy particulates is minimized as they settle out before the reading is accepted.

01/09/85-Controls QCA, QCB introduced: these controls are aqueous suspensions of beads composed of a styrene-divinylbenzene polymer and are formulated to "match" the performance of formazin standards on the Hach 18900 turbidimeter.

*Insufficient data collected for inclusion in performance report.

TURBIDITY
QUALITY CONTROL DATA FROM 03/01/85 TO 02/10/85

Lab: Rivers and Lakes

Analytical Range: 0.21 to 50.0 FTU

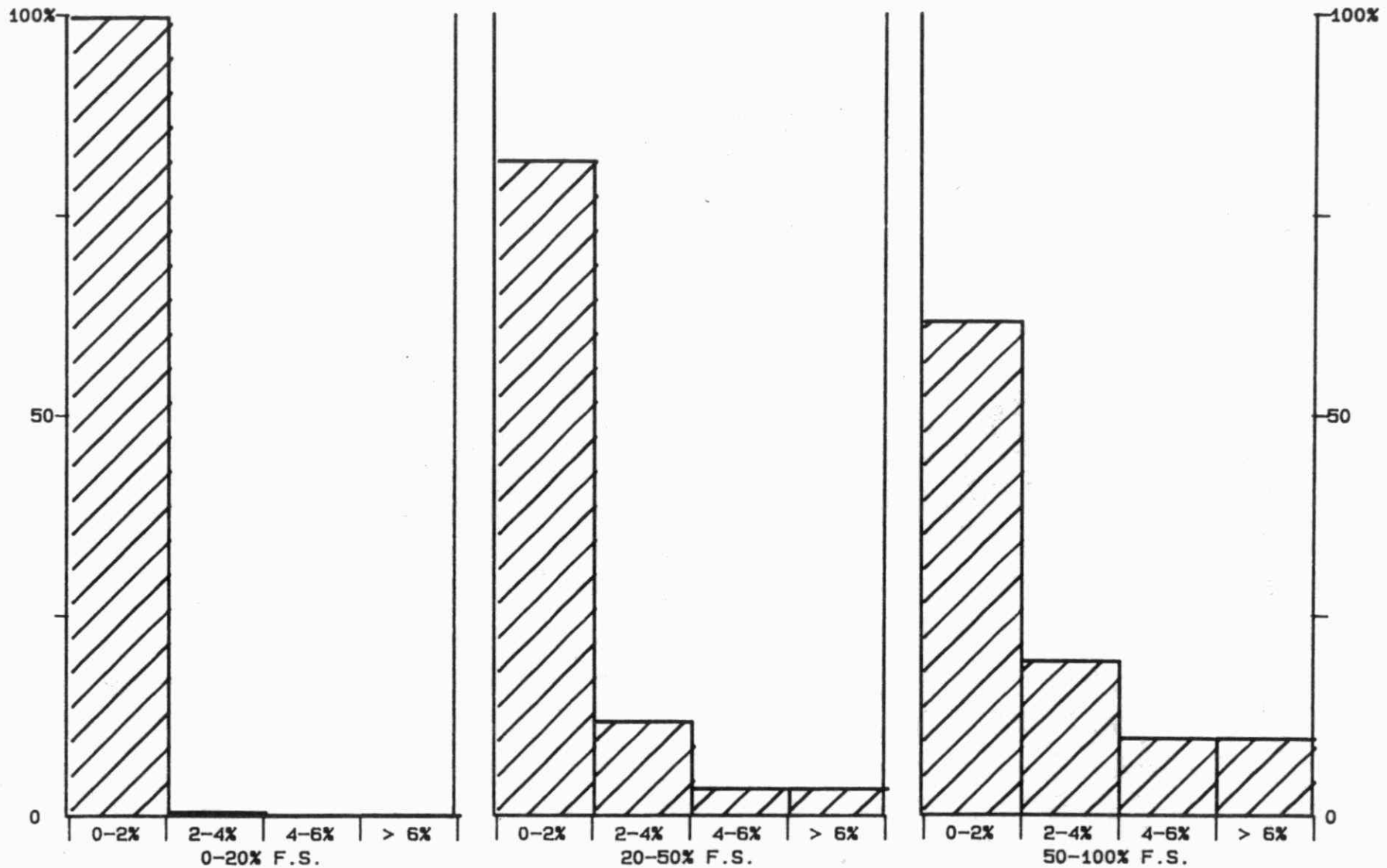
DUPLICATES:	Number of Data Pairs	Sample Concn Span	Mean(2) s.d.	Coefficient of var.(%)
	-----	-----	-----	-----
	78	0.00 - 2.00	0.069	5.0
	110	2.00 - 5.00	0.166	4.9
	74	5.00 - 10.00	0.219	3.0
	90	10.0 - 50.0	1.17	5.5
	352	Overall	0.61	N/A

DETECTION CRITERION: 0.21

QUALITY CONTROL GRAPH

TURBIDITY (FTU)

FROM: 03/01/85
TO: 02/10/85



CONCENTRATION DIFFERENCE BETWEEN DUPLICATES
FULL SCALE VALUE (F.S.): 50 FTU

TD
380
0578
1986